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TRANSACTIONS

OF THE

AMERICAN THERAPEUTIC SOCIETY

ORGANIZED MAY 1, 1900

INCORPORATED JULY 7, 1904

1914

EDITOR

P BRYNBERG PORTER, A.M., M.D.

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Schoeler, Heinrich	Berlin, Germany
Tillmanns, Hermann	Leipsic, Germany

Ex-Presidents.

Horatio C. Wood	Philadelphia, Pa.	1900-1
Reynold Webb Wilcox	New York, N. Y.	1901-2
Thomas E. Satterthwaite	New York, N. Y.	1902-3
*Howard H. Barker	Washington, D. C.	1903-4
Oliver T. Osborne	New Haven, Conn.	1904-5
*Carl Beck	New York, N. Y.	1905-6
*Robert Reyburn	Washington, D. C.	1906-7
*John V. Shoemaker	Philadelphia, Pa.	1907-8
Frederic H. Gerrish	Portland, Me.	1908-9
James C. Wilson	Philadelphia, Pa.	1909-10
Harvey W. Wiley	Washington, D. C.	1910-11
Alexander D. Blackader	Montreal, Can.	1911-12
Noble P. Barnes	Washington, D. C.	1912-13
Howard Van Rensselaer	Albany, N. Y.	1913-14

*Deceased.

DECEASED MEMBERS

Samuel Claggett Busey, M.D., LL.D., died Oct. 19, 1899.
William P. Manning, M.D., died Feb. 9, 1901.
John Thomas Winter, M.D., LL.D., died June 22, 1902.
George Edward Tyler, M.D., died July 7, 1902.
Robert Henderson Graham, M.D., died Aug. 24, 1903.
George Bingham Fowler, M.D., died March 6, 1907.
John S. McLain, M.D., died June 2, 1907.
Robert Reyburn, M.D., died March 25, 1909.
Justin Steer, M.D., died June 20, 1909.
Howard H. Barker, M.D., died May 8, 1910.
John Veitch Shoemaker, M.D., died October 11, 1910.
Carl Beck, M.D., died June 8, 1911.
Henry Alfred Robbins, M.D., died October 26, 1911.
John Herr Musser, M.D., died April 3, 1912.
Louis Nelson, A.M., M.D., died April 14, 1912.
Frederick Forchheimer, M.D., died June 1, 1913.

CONSTITUTION AND BY-LAWS

ARTICLE I.

This Society shall be known as the American Therapeutic Society.

ARTICLE II.

The object of this Society shall be the promotion of therapeutics in its broadest sense.

ARTICLE III.

This Society shall meet annually at such time and place as the Council may determine.

ARTICLE IV.

SECTION 1. The Officers of this Society shall consist of a President, three Vice-Presidents, a Secretary, a Treasurer, and a Council of fifteen members, all to be elected from the active membership, by ballot, at an annual meeting.

SECTION 2. The Council may be convened at any time by the Chairman, at the request of any three of its members. Its decisions shall be equivalent to acts of the Society, and shall be reported to it at the next regular meeting. The Council shall elect from its members a Committee on Admissions to consist of three members.

SECTION 3. A vacancy occurring in any office may be filled by the Council.

ARTICLE V.

SECTION 1. This Society shall consist of not more than one hundred active members. Honorary members may be elected on recommendation of the Council.

SECTION 2. Any qualified physician engaged in the general or special practice of medicine or surgery, or in laboratory research of interest in the treatment of disease, is eligible for membership.

SECTION 3. Applications for membership should be made in writing at least one month before the annual meeting. They are to be referred to the Committee on Admissions, which shall, on approval, present their names to the Society at the annual meeting. Five negative ballots shall reject an applicant.

SECTION 4. Applications for membership shall be accompanied by the annual dues for the ensuing year.

SECTION 5. Resignation of members shall not be accepted until all dues have been paid.

ARTICLE VI.

All proposed changes of the Constitution must be offered in writing at a regular meeting. They are to be considered only at an annual meeting, when a two-thirds vote of the members present shall be necessary for their adoption.

By-Laws.

1.

The *President* shall preside at the annual meeting of the Society, and deliver an address. He shall appoint a Committee on Scientific Business and a Committee of Arrangements.

In the absence of the President, one of the Vice-Presidents shall preside.

2.

The *Secretary* shall keep a record of the transactions of the Society and of its Committees, conduct all correspondence of the Society, and mail to each member a programme of the meeting, at least two weeks before it is held. The records, publications and seal of the Society shall be in his custody.

The *Treasurer* shall collect all moneys due the Society, disburse the same, as directed by the Council, keep a proper account of all his transactions, and render an annual statement to the Society. He shall have charge of all property belonging to the Society not otherwise provided for.

3.

Ten active members shall constitute a quorum for the transaction of business.

4.

SECTION 1. The *Council* shall constitute a standing committee to consider all matters of interest to the Society. It shall elect a Chairman, Vice-Chairman and a Secretary, and shall appoint an Editor of the Transactions.

SECTION 2. Three members of the *Council* shall be elected annually by the Society, each to serve five years.

SECTION 3. Five members shall constitute a quorum.

5.

The *Committee on Admissions* shall investigate the qualifications of applicants and report at the next annual meeting.

6.

Charges against any member must be made in writing. They shall be referred to the *Council* for investigation.

7.

No papers, report, abstract or other communication, either written or verbal, which, directly or indirectly, commends or advocates any secret, patented or trade-marked product or method of treatment shall be presented to or received by the Society; nor shall any discussion on such product or method be permitted.

Papers are limited to twenty minutes and discussions to five minutes.

8.

The *annual dues* shall be five dollars, payable in advance.

9.

The *order of business meetings* shall be as follows:

1. Reading of Minutes.
2. Reports of Officers and Committees.
3. Election of Members.
4. Presentation of Communications.
5. Miscellaneous Business.
6. Election of Officers.

PAPERS READ BEFORE THE SOCIETY.*

Anders, J. M.—What Constitutes a Useful Drug, and Shall the Preparations of a Useful Drug be Limited to One or Two? Read by title. (*Monthly Cycloped. and Med. Bulletin,* Feb., 1911.) Obituary of Dr. J. V. Shoemaker (1911). Dioxydiamidoarsenobenzol in the Treatment of Various Clinical Forms of Syphilis (*Monthly Cycloped. and Med. Bulletin,* July, 1912).

Anderson, H. B.—The Medical Treatment of Cholelithiasis (*Monthly Cycloped. and Med. Bulletin,* Nov., 1913).

Babcock, W. W.—The Range of Activity and the Untoward Effects of Certain Spinal Analgesics: Based on Two Thousand Administrations (1910). Uses and Limitations of General Anesthesia as Produced by Subcutaneous and Intravascular Injections (*Monthly Cycloped. and Med. Bulletin,* Jan., 1912). The Dangers and Disadvantages of Spinal Anesthesia (*N. Y. Med. Journal,* Nov. 8, 1913). The Topical Employment of Tuberculin in Hydrocele and Other Serous Effusions, Tuberculous Adenopathies, and Chronic Sinuses (*N. Y. Med. Journal,* Nov. 14, 1914).

Barnes, N. P.—Bacterins: their Present Status in Therapeutics (1910). Filariasis: Report of a Case Treated with Dioxydiamidoarsenobenzol (*Monthly Cycloped. and Med. Bulletin,* Jan., 1913). Presidential Address (*Monthly Cycloped. and Medical Bulletin,* Oct., 1913).

Barton, W. M.—Hexamethylenamine in the Treatment of Otitis Media (1910). Copper Chemotherapy, with Especial Reference to the Double Tartrate of Copper Oxide and Sodium (*Monthly Cycloped. and Med. Bulletin,* Nov. and Dec., 1913). A Case of Post-Diphtheritic Paralysis Apparently Cured by Sixty Thousand Units of Antitoxin. Read by title (*N. Y. Med. Journal,* Oct. 3, 1914).

Beates, H., Jr.—Some Fundamental Principles in Digitalis Therapy. Read by title (*Monthly Cycloped. and Med. Bulletin,* Sept., 1912).

Beck, C.—On Morbus Basdowi. Read by title (1910).

Beebe, S. P.—The Preparation of Thyroid Gland for Use (1910).

Bishop, L. F.—The Treatment of Arteriosclerosis (*Monthly Cycloped. and Med. Bulletin,* Aug., 1913). Digitalis in Chronic Disorders of the Heart, with Special Reference to the Advisability of its Continuous Administration (*N. Y. Med. Journal,* Aug. 29, 1914).

Blackader, A. D.—Presidential Address (*Monthly Cycloped. and Med. Bulletin,* Aug., 1912).

Blake, C. J.—Obituary of Dr. Louis Nelson (1912).

Boos, W. F.—The Newer Heart Remedies (1911).

Brown, P. K.—A Modified Vaccine Therapy in Pneumonia; with Animal Experiments (1911).

Cohen, S. S.—What Unofficial Drugs are of Sufficient Clinical Value to be Recognized in the U. S. Pharmacopœia of 1910? Read by title (1910). Recent Improvements in the Quinine Treatment of Lobar Pneumonia (*Journal of Amer. Med. Association,* July 12, 1913).

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* For list of papers read before the Society from its organization to the year 1909, inclusive, see the *Transactions* for 1909.

Croftan, A. C.—The Nature of the Cardiovascular Changes in Nephritis (*Monthly Cycloped. and Med. Bulletin*, Sept., 1912).

Crothers, T. D.—The Delusion of the Stimulant and Tonic Effects of Alcohol (*Monthly Cycloped. and Med. Bulletin*, July, 1911).

DaCosta, J. C., Jr.—The Routine Use of the Autogenous Vaccines (Bacterins) in the German Hospital, Philadelphia (1910).

Davis, N. S., Jr.—Should the Pharmacopœia Contain Only Useful and Efficient Drugs? (*Monthly Cycloped. and Med. Bulletin*, Feb., 1911).

Dawes, S. L.—The General Treatment of High Blood-Pressure (*Monthly Cycloped.. and Med. Bulletin*, Dec., 1912).

Evans, D. J.—High Blood-Pressure in the Toxemias of Pregnancy (*Monthly Cycloped. and Med. Bulletin*, Nov., 1912).

Evans, G. H.—Climatic Conditions in California, and their Influence in the Treatment of Tuberculosis (*Monthly Cycloped. and Med. Bulletin*, Sept., 1913).

Fisher, E. D.—Senile Epilepsy (*Monthly Cycloped. and Med. Bulletin*, Sept., 1910). General Paresis, Tabes, and Cerebrospinal Syphilis. Read by title (*Monthly Cycloped. and Med. Bulletin*, 1912). High Blood-Pressure Arising from Nervous Strain in Diseases of the Nervous System (*Monthly Cycloped. and Med. Bulletin*, Oct., 1912). Dioxydiamidoarsenobenzenemonomethane Sodium Sulphate in Syphilis of the Nervous System (1913).

Flick, L. F.—Skin Inunctions as a Therapeutic Measure. Read by title (*Monthly Cycloped. and Med. Bulletin*, Aug., 1910).

Freeman, E. B.—Treatment of Splanchnoptosis; with Report of Cases (1913).

Friedenwald, J.—The Effect of Scarlet Red in the Treatment of Ulcer of the Stomach and Duodenum (*Monthly Cycloped. and Med. Bulletin*, June, 1913).

Fussell, M. H.—Further Consideration of the U. S. Pharmacopœia. Read by title (*Monthly Cycloped. and Med. Bulletin*, March, 1911). Obituary of Dr. J. H. Musser (1912).

Gallant, A. E.—The Delayed Menopause: Its Dangers and Therapeutic Indications (*N. Y. Med. Journal*, June 18, 1910). Panhysterocolpectomy for Hernia Vaginæ (*Monthly Cycloped. and Med. Bulletin*, Dec., 1911). The Therapeutics of Sacro-iliac Relaxation as a Sequel to Surgical Operations (*Monthly Cycloped. and Med. Bulletin*, Feb., 1913). Prolonged-Precipitate Parturition Due to Disengagement of the Disproportionate Head (*Med. Record*, Aug. 23, 1913). Continuous Uterine Drainage: A Résumé of 250 Cases of Intermenstrual Plus Intramenstrual Obstructions (*N. Y. Med. Journal*, Oct. 10, 1914). An Improved Ether Inhaler (*N. Y. Med. Journal*, Oct. 31, 1914).

Gompertz, L. M.—Medical Treatment of Gastric and Duodenal Ulcer (*Monthly Cycloped. and Med. Bulletin*, March, 1913).

Gorlinier, H. C.—Chronic Acetanilide Poisoning a Perfectly Definite Symptom-Complex (*Monthly Cycloped. and Med. Bulletin*, 1912).

Hemmeter, J. C.—Hyper- and Hypotonicity of the Vagus and Sympathetic Nervous System; Neurochemical Synergism of the Normal Body and its Suggestions for Physiological Therapeutics (*N. Y. Med. Journal*, Jan. 17, 1914).

Hitchens, A. P.—A Discussion of Current Developments and Problems in Vaccine Therapy (*Monthly Cycloped. and Med. Bulletin*, Oct., 1913).

Hughes, L. F.—Obituary of Dr. Justin Steer (1911).

Juettner, O.—Obituary of Dr. F. Forchheimer (*N. Y. Med. Journal*, Aug. 8, 1914).

Kebler, L. F.—The Present Status of Drug Addiction in the United States (*Monthly Cycloped. and Med. Bulletin*, Jan., 1911).

King, A.—Further Study of Diabetes as an Infectious Disease (*Monthly Cycloped. and Med. Bulletin*, July, 1910). Diabetes Mellitus from a Surgical Standpoint (*Monthly Cycloped. and Med. Bulletin*, Aug., 1911).

Kirk, W., Jr.—Auricular Fibrillation: Its Diagnosis and Treatment (1914).

Koplinski, L.—Further Use of Solution of Calcium Creosote in Medicine (*Monthly Cycloped. and Med. Bulletin*, Aug., 1910; June, 1911). On the Uses of Nickel Sulphate in Medicine (*Monthly Cycloped. and Med. Bulletin*, June, 1911). The Proper Dietetic Treatment of Diabetes Mellitus (*Monthly Cycloped. and Med. Bulletin*, Aug. and Sept., 1912). The Treatment of Pneumonia with Mercury and Sulphur Internally (*Monthly Cycloped. and Med. Bulletin*, July, 1913). Cardiac Headache: Description and Treatment (*N. Y. Med. Journal*, Aug. 1, 1914).

Larrabee, R. C.—The Treatment of Leukemia with the Mixed Toxins of Coley (1911).

Leech, D. O.—Obituary of Dr. H. H. Barker (1911).

Long, E. H.—The Metric System. Read by title (*Monthly Cycloped. and Med. Bulletin*, March, 1911).

McPhedran, A.—Treatment of Pneumonia (*Monthly Cycloped. and Med. Bulletin*, June, 1910).

Morgan, F. P.—Suggestions for the Pharmacopœia of 1910: A Brief Consideration of the Subject in its Relation to the Federal Food and Drugs Act (*Monthly Cycloped. and Med. Bulletin*, March, 1911). Alleged Tuberculosis Cures upon the Market (*N. Y. Med. Journal*, Oct. 31, 1914).

Morris, R. T.—Surgery of the Obese. Read by title (*Monthly Cycloped. and Med. Bulletin*, 1910). Epithelial Conductors and Obstructors (*Monthly Cycloped. and Med. Bulletin*, Aug., 1911). Newer Notes on the Subject of Peritoneal Adhesions (*Monthly Cycloped. and Med. Bulletin*, Sept., 1913). Non-Operative Treatment of Tuberculous Neck Glands (*N. Y. Med. Journal*, Oct. 3, 1914).

Morton, W. G.—Note on Fluorescence Excited Within Human Tissues as a Method of Treatment (*Monthly Cycloped. and Med. Bulletin*, Nov., 1911).

Nagle, E. W.—Some Observations on Vaccine Therapy (*Monthly Cycloped. and Med. Bulletin*, June, 1911).

Osborne, O. T.—U. S. P., 1910. How May It be Constructed? (*Monthly Cycloped. and Med. Bulletin*, Jan., 1911). Common Types of Thyroid Hyposecretion (*Journal of Amer. Med. Association*, 1912). The Absurdities and the Commercialism of the Proposed Ninth Decennial Revision of the U. S. Pharmacopœia (*Journal of Amer. Med. Association*, 1913).

Porter, P. B.—The Tuberculosis Home Hospital Experiment (*Amer. Medicine*, Sept., 1914).

Porter, W. H.—Sodium Nitrite in Arterial Hypertension (*Monthly Cycloped. and Med. Bulletin*, Feb., 1913). The Acquisition of Tuberculosis (*Amer. Medicine*, Sept., 1914).

Pottenger, F. M.—Some of the Factors which Alter Blood-pressure in Pulmonary Tuberculosis (*Monthly Cycloped. and Med. Bulletin*, Oct., 1912). What Does Treatment Offer to the Advanced Tuberculous Patient? (*Monthly Cycloped. and Med. Bulletin*, Oct., 1913). Presentation of a Case of Tuberculosis, Third Stage, with Healed Lesions of the Tongue and Larynx (1914).

Reilly, T. F.—Parageusia and its Treatment (*N. Y. Med. Journal*, Nov. 28, 1914).

Remington, J. P.—Revision of the United States Pharmacopœia (*Monthly Cycloped. and Med. Bulletin*, Feb., 1911).

Ross, G. G.—A Case of Recurrent Abscess Formation, Due to Staphylococcus Infection, Successfully Treated by Autogenous Vaccines. Read by title (*Monthly Cycloped. and Med. Bulletin*, Sept., 1910).

Roussel, A. E.—Pulmonary Syphilis, with Report of a Case Promptly Responding to Specific Treatment (*N. Y. Med. Journal, Sept. 27, 1913*).

Rudolf, R. D.—Effects of Medicinal Doses of Aconite upon the Pulse Rate. Read by title (*Amer. Journal of Med. Sciences*, Dec., 1912).

Russell, F. F.—Antityphoid Inoculations (1913).

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FREDERICK FORCHHEIMER.

BY OTTO JUETTNER, M.D.,

CINCINNATI.

It is my desire to say a few words in memory and appreciation of my townsman, Frederick Forchheimer, a distinguished member of the American Therapeutic Society, whose demise occurred at a time when his career was full of promise to his profession, to his home town, and—above all—to the school over which he presided with signal force and distinction. That he should have been struck down in the fullness of his prowess seemed like a tragedy, an ineffably cruel dispensation of destiny. Yet the end was not without an element of the heroic in that it literally embodied the Solonic ideal of greatness and happiness so beautifully exemplified by the wise Athenian when he told the story which reached the heart of the Asiatic despot, Crœsus. Forchheimer had much to live for. Cincinnati, once the proud queen of western medicine and now struggling to regain the laurels of the past, needed a master to tread in the footsteps of James T. Whittaker and P. S. Conner. Forchheimer had begun to loom up as the exponent of a new era in Cincinnati, of new thought in medical practice and medical teaching in the old town where western medicine was born and was reared by at least three generations of giants. Forchheimer embodied the full maturity of latter day medical science. He was a ripe product of his time. He was eminently fit to live; on the other hand, in harmony with the Hellenic ideal of heroic dissolutions, fully prepared to terminate his career in the very hour of his greatest strength and achievement.

Forchheimer received his degree in medicine at the New York College of Physicians and Surgeons in 1873, when he was twenty years of age. After a few years of study in Europe, especially in Vienna, he settled in his home town, Cincinnati. In 1876 he began his career as a medical teacher in the capacity of demonstrator of morbid anatomy and histology at the old Medical College of Ohio. The following year he became professor of chemistry. Three years later he was made professor of physiology and clinical pediatrics. During his incumbency of the chair of physiology he published an excellent American edition of Hofmann and Ultzmann's *Guide to the Examination of Urine*. In 1900, upon the demise of the distinguished James T. Whittaker, Forchheimer became the professor of practice. When P. S. Conner retired from active work, Forchheimer was elected dean of the faculty. In 1907 he gave to the profession the results of his ripe scholarship and vast experience in the form of an encyclopedic textbook of practice under the title of

Prophylaxis and Treatment of Internal Diseases. It was followed by a still larger work prepared with the collaboration of many special contributors and published under the collective title of *Forchheimer's Therapeusis of Internal Diseases.* This work is without a doubt *Monumentum ære perennius* to its author. Since 1860 Cincinnati has contributed at least a dozen books on internal medicine to the medical literature of this country. Of book writing there has been no end, but not many books have achieved a national significance in point of value and influence. Only three books on practice have been written in Cincinnati since 1860 that were epoch making in their influence on the medical thought of the entire country. One was *A Practical Treatise on Phthisis Pulmonalis,* by Leonidas Moreau Lawson. Then came Roberts Bartholow's classical book, and—last but not least—the work on practice by James Magoffin French, a wonderfully clever and practical book. These three books represent an achievement of no mean significance. To say that *Forchheimer's Prophylaxis and Treatment* is a worthy peer of the three great works mentioned, is but paying a just tribute to the mastery of his subject which its author possessed in so high a degree. This work bears eloquent testimony to the fine sense of synthetic discrimination, analytical succinctness, and critical coordination so characteristic of Frederick Forchheimer. The honorary degree of doctor of philosophy, granted him by Harvard University, could not have been bestowed upon one more worthy.

Forchheimer, the physician and teacher, was a well balanced and well rounded product of his day. But there is much more to be said about him. Even at the risk of disclosing to the gaze of the world some things which he in his characteristic way secreted behind the portals of his home and reserved for the privacy of his leisure hours, I venture to point out a rare and lovable psychic duality which Forchheimer embodied. When he heeded the summons

> . . . . . to join
> The innumerable caravan which moves
> To that mysterious realm where each shall take
> His chamber in the silent halls of death,

it was not only his colleagues, his fellow physicians, and students, who gathered around his bier to pay homage to his genius and the worth of his life work: among those who mourned were the members of another profession, the devotees of music, the most heavenly of the arts, because Forchheimer was a musician, a violinist of unusual merit, not merely a lover of music, an amateur, but an artist whose talent was the marvel of the musical fraternity in Cincinnati. In his early days in Vienna he enjoyed the friendship of Johannes Brahms, whose work in the renaissance of classic art was understood by few only at that time. Forch-

heimer was admitted to the select circle which had gathered around Brahms. There was Eduard Hanslick, the austere apostle of classic form; Joseph Joachim, the master violinist of his age, and Theodor Billroth, supremely great as a surgeon, but no less a striking figure as a pianist and composer. Amid such environment young Forchheimer's receptive and impressionable mind was moulded. Here he gathered the riches of mind and heart that filled his life to overflowing, true to the Hippocratic aphorism which places the shortness of life and the length and richness of art in juxtaposition.

In the contemplation of the life of Forchheimer, the scientist and physician, and Forchheimer, the dreamer and artist, upon whom the Muses smiled all through his career, we see consummate perfection, a veritable ideal of happy existence. Such a life has no sorrow, such a death no sting. Frederick Forchheimer, our departed fellow member and colleague, passed from the midst of us,

> . . . sustained and soothed
> By an unfaltering trust, approached the grave
> Like one who wraps the drapery of his couch
> About him and lies down to pleasant dreams.

SCIENTIFIC PROCEEDINGS.[1]

FIFTEENTH ANNUAL MEETING,

Held at the Historical and Art Building, Albany, N. Y., May 29 and 30, 1914

The Address of Welcome was made by the Rev. Charles A. Richmond, D.D., LL.D., Chancellor of Union University, and responded to on behalf of the Society by Dr. Oliver T. Osborne, of New Haven, Conn.

PRESIDENT'S ADDRESS.

BY HOWARD VAN RENSSELAER, M.D.,

ALBANY, N. Y.

A Study of the Therapeutic Effects of Thermopenetration in the Treatment of Phthisis Pulmonalis.

Many years ago, he said, a patient collaborator of statistics had recorded that in lesions of the mitral valve consumption was one of the rarest of complications, though he drew no deduction from this fact, observed, as the result of study, in a vast number of cases of heart disease. If we tried to trace out the relationship between cause and effect here, and if we considered for a moment, the morbid anatomy which mitral disease produced in the lungs, we were struck by the fact that in mitral disease there is regularly a marked congestion of the lungs. By theoretical reasoning, then, it would seem that where there was an enormous amount of blood in the lungs tubercle were more readily destroyed, or were at least prevented from multiplying as they did in the anemic condition of rundown individuals. The obvious therapeutic indication from this reasoning would be to produce a congestion in the lungs as a means for combating the inroads of consumption, and theoretically what was wanted was not a passive, but an active congestion, caused by something which would directly heat up the lung as a whole, or any particular part of it desired, without producing a general conges-

[1]It is to be understood that the Society does not hold itself responsible for any views expressed by the readers of papers or participants in discussions.

tion over a large area of the body. This it had been impossible to accomplish until the discovery of the many-sided effects of the high frequency current.

At the tuberculosis camp of the Albany Hospital the employment of this current had given the best results of any special treatment which had been tried there. The patients had been impartially divided into three classes for treatment; those given the high frequency current, those given tuberculin, and those given no special treatment, which were called control cases. The benefits so far obtained from the high frequency current, in comparison with the other methods, were: (1) The ability to keep the patients longer in the hospital. (2) The greater increase in weight (five times greater), and the larger percentage of those whose weight was increased. (3) Of the discharged patients, 69 per cent. apparently cured or arrested, against 15.5 per cent. as the best of the other methods. A careful study of the large number of blood counts showed, in general, that in the cases which improved and got well both the red cells and the hemoglobin (which had usually been diminished) returned to normal, that the white cells decreased, and that the percentage of polymorphonuclears decreased, while that of the lymphocytes increased to normal.

REPORT OF CASE OF HEALED TUBERCULOSIS OF THE TONGUE, LARYNX AND LUNGS.

BY FRANCIS M. POTTENGER, A.M., M.D., LL.D.,

LOS ANGELES, CAL.,

Medical Director of the Pottenger Sanatorium for Diseases of the Lungs and Throat, Monrovia, Cal.; Professor of Diseases of the Chest, Medical Department of the University of California.

Patient, male, aged 41 years. Family history free from tuberculosis, except one maternal aunt. Patient of strong, muscular build. Previous diseases, typhoid fever when 24. Eleven years ago he began to show clinical symptoms of tuberculosis: malaise, frequent colds, and hoarseness, followed, a little later, by cough and bacillus-bearing sputum. Physical examination at that time revealed tuberculous infiltration at both apices, with complicating infiltration of larynx. Patient stopped work, changed climate, and regained his health. Was ordered to drink whiskey for his tuberculosis; which he did until he became thoroughly addicted to its use, taking eight and ten drinks a day. Resumed work, and continued same until Spring of 1912, without return of symptoms. In Spring of 1912 patient showed slight cough and some hoarseness, for which he consulted a throat specialist, who treated him until the following Fall. In Summer of 1912 an ulceration on left side of tongue developed, and this persisted in spite of all treatment. In October, 1912, patient came to California, expecting the climate to cure him; but, not getting the relief he looked for, he was sent to me by Dr. Hastings of Los Angeles.

At the time I first saw him he had active disease in both lungs to the third rib anteriorly and middle of scapula posteriorly. In the larynx there was infiltration of both true and false vocal cords, with some ulceration; infiltration of both arytenoids and of the interarytenoid space, with ulceration of the right arytenoid, patient articulating with great difficulty; and a large ulcer of the tongue beginning about half an inch from the tip and extending for a distance of 1½ inches along the left border, taking in the entire side of the organ. Examination of the sputum showed 35 c.c. per day, with 30 bacilli to a field. Urine, 1050 c.c. per day, specific gravity, 1021; free from albumin and sugar, with high indican content. Blood, hemoglobin, 85; white cells, 7,500. Patient

was in good physical condition, and his temperature was rarely much above normal. His nervous and mental condition, however, was bad. He had been under favorable climatic and hygienic conditions since coming to California, but had shown no signs of improvement.

Patient entered sanatorium on March 3, 1913. Whiskey was taken off at once and he was put upon rest, good, substantial food, without stuffing, continuous open air in an open bungalow, and tuberculin.

July 6, 1913, sputum had been reduced to 5 c.c. a day, and was free from bacilli on 15 minutes' search, after digesting and shaking; larynx was clearing and the ulceration healed; ulcer on tongue healed except a small, deep slit posteriorly.

December 24, 1913. Sputum scant, with no bacilli; lungs free from signs of activity; ulceration in larynx completely healed, infiltration almost gone; voice husky, but patient converses without difficulty; ulcer on togue closed, but reaction following each tuberculin injection still marked in tissues.

March 14, 1914. Lungs healed, presenting only signs of scar tissue, with small healed cavities at both apices; larynx healed, apparently free from all infiltration; voice quite smooth, patient talks without great effort; tongue healed, no longer showing any signs of tuberculin reaction, even after large doses.

This case is interesting from many standpoints:—the extent of the lesions; the fact that the lungs and larynx had been previously involved; the fact that the patient had become addicted to alcohol through medical advice given ten years previously, and that he at once quit it when coming under my care; the fact that he had had general hygienic and climatic treatment, without avail, for several months before entering the institution; and the fact that when put under a regular régime, with tuberculin treatment, he improved at once, and continued to do so until all active signs in all lesions had disappeared. The fact that he had had the disease before was both an advantage and a disadvantage—an advantage because a high degree of immunity had been developed; a disadvantage because we were attempting to treat an acute process through poorly vascularized scar tissue.

This result is, to my mind, a triumph for the therapeutic application of tuberculin. It was possible to watch its action from weak to week and to control dosage by the local process. It was instructive to the physicians and gave hope and courage to the patients who watched it from time to time. This is the seventh case of tuberculosis of the tongue which I have treated. Three were in patients with acutely active disease and were under treatment only until the patient succumbed to the pulmonary disease. The other four were in cases of less activity. Three, including the present patient, are healed, and one is still under treatment, with the ulcer healing in a satisfactory manner.

Such patients can be treated successfully by knowing what the remedies used are expected to accomplish, and persisting in their employment. The results are slow, but tuberculous processes always go slowly if they go the right way. While a tubercle may soften and be expelled in a few days, it can heal only after weeks, and often months. The reason favorable results are not obtained more often is because of a failure to realize this fact, because of an inability to keep the patient satisfied and interested long enough, and because of the physician's not having confidence that he has within his reach the remedy to bring about the desired result.

NONOPERATIVE TREATMENT OF TUBERCULOUS GLANDS OF THE NECK.

BY ROBERT T. MORRIS, M.D.,

NEW YORK, N. Y.,

Professor of Surgery, Post-Graduate Medical School and Hospital.

The method for treatment of tuberculous glands of the neck which I employed for many years was acquired in Germany. It consisted of a very thorough and painstaking removal of the glands *en masse*, avoidance of nerve branches, and other technical details which were quite perfect from the surgical point of view. In a number of cases there was recurrence of the tuberculosis, and when I lost a beautiful young girl from acute general miliary tuberculosis succeeding immediately upon operation, I took up the study of some of the methods for nonoperative treatment, which had been reported from time to time, but without engaging the acute interest of surgeons.

The first plan consisted in the use of the injection of a seven per cent. solution of iodoform in oil, according to the plan of Mosetig-Moorhof. From one to three minims of this solution were injected into each one of the larger glands at a sitting, the injection sometimes being preceded by a trifle of cocaine. In addition to the local treatment the patients were placed upon hygienic and medical resources suitable for tuberculosis in general.

The results of the treatment were surprisingly good, and we soon had at the clinic a number of patients who were becoming progressively and rapidly better, and evidently without need for operative interference, excepting in cases in which glands had actually broken down and were suppurating.

The injections of iodoform were made at intervals of three or four days, and the younger patients objected very much to the treatment. On this account other resources were taken into consideration, and it was a question if the new proposition of Bier for producing local hyperemia might be applied. This was successfully accomplished by having the reclining patient rest, first, with the neck against a hot water bag for a minute or two, and then against an ice bag for a minute or two; then back to the hot water bag, and to the ice bag alternately, for an hour or twice a day. The hyperemia which was established under this method of treatment proved to be quite as successful as the iodoform injection method, and even young patients did not object. The length of time required, and attention on the part of some one with time to spare, introduced the only objectionable features. I commonly observed a practical cure of tuberculosis of the glands of the neck anywhere within from one month to six months of treatment.

When seeking for some less irksome line of procedure, some of the

patients were subjected to the high frequency electric current, and more lately to the new high penetrating X-ray. In a number of cases this has been the most effective treatment, the only objectionable feature being the expense for patients who cannot obtain the benefit of these resources at a public institution.

More recently I have taken up the idea of adding to the other resources the treatment with tuberculin. Tuberculin is used less in New York City perhaps than in any other great medical center in the world. The reason for this may apparently be charged against our psychology of impatience and the desire to obtain quick and definite results. Any one who acquaints himself with the literature of tuberculin will, I think, be convinced that when this method is applied in the right way and for a sufficient length of time, it is one of the most important of our resources against tuberculosis. In fact, I would hardly feel that I was doing the right thing for my patients with tuberculosis of any sort unless the tuberculin treatment was at least added as one feature. A prospective refinement which comes to mind is the idea of making a closer diagnosis, separating cases of bovine tuberculosis from those of human tuberculosis: and employing bovine tuberculin or human tuberculin in these cases respectively.

When preparing these notes, I asked one of my assistants at the Post-Graduate Hospital if he could get together records of all of our cases of tuberculous glands of the neck for the past ten years, but these cases, treated in the outpatient department, are not recorded according to the card system quite well enough for scientific report, and I can state only that in the past ten years we have treated in that department under my service considerably more than 100 cases of tuberculous glands of the neck without operation in a single one, excepting for glands which were actually suppurating, and for these glands alone, leaving the remaining mass to be treated by some one of our conservative resources.

In outpatient work it is practically impossible to follow all of the cases for end result reports. Many of the children who have made definite improvement are not brought back to the clinic when, in the opinion of their parents, treatment has become less necessary. Some of the older patients, finding it difficult to get away from their work in shop or factory, come at irregular intervals after improvement is well under way. In private practice my work is almost wholly consultation work, and cases are seen with their physicians, who report from time to time, but not in a way for accurate report. One fact, however, is significant, that previous to ten years ago I operated many times in the course of a year for the removal of tuberculous glands of the neck, but during the past ten years I have not operated once for nonsuppurating glands.

THE ACQUISITION OF TUBERCULOSIS.

BY WILLIAM HENRY PORTER, M.D.,

NEW YORK, N. Y.

Professor Emeritus in the New York Post-Graduate Medical School and Hospital, etc.

Experimental investigation has stamped tuberculosis as contagious, that is, accepting the bacillus of Koch as the essential element of the disease.

Tuberculosis is not contagious in the same sense as scarlet fever, smallpox, measles, etc., but it is contagious in the fact that bacilli can be directly inoculated into the system, and under favorable circumstances will produce this very common and most dreaded disease. This being true, the next question is: Where and how does the infection take place? Science replies: By direct inoculation after birth.

In the past, tuberculosis was considered largely as an inherited disease. In the present scientific acceptation of the term, tuberculosis is not an inherited disease, but is a condition that has always to be acquired after birth. This is established upon the following data—namely, an abundance of carefully recorded post-mortem evidence, which gives the exact frequency of tubercular lesions from the time of conception up to the fifteenth year of extra-uterine life. Included in this evidence is the Inaugural Dissertation of Bolitz[1] in 1890, where the results of 2,570 necropsy examinations in children are recorded. In the still-born none were found tuberculous. Under the fourth week of extra-uterine life, tuberculous lesions were not found. From the fifth to the tenth week, less than one per cent. gave evidence of tuberculosis.

But from the third to the sixth month, a fraction over eight per cent. contained well-defined tuberculous lesions. From the sixth to the twelfth month, a fraction over eighteen per cent. were found to be tuberculous. From the first to the second year, a fraction over twenty-six per cent.; and from the end of the second year to the fifteenth, at least thirty per cent. were the seat of tuberculous lesions.

It has been further established that primary infection rarely occurs after this age; that whenever tuberculosis manifests itself later in life, it is due to a childhood infection which has been lying dormant in the system—to be nursed into activity solely by a lowering of the general nutritive processes of the body, and, finally, a localization of this deteriorated nutritive activity at some specific spot, as the lungs, other

[1] Bolitz: Inaugural Dissertation, Kiel, 1890.

viscera, or in the bones, until a soil is developed suitable to the growth of the bacilli.

Here again, the emphasis rests not upon the inoculation but upon the lowering of the nutritional forces.

This being the case, all the clamor about the danger to a locality from the presence of a preventorium or sanatorium for tuberculosis, is based upon a false idea of tuberculosis and its acquisition.

In the face of such knowledge as this, and abundance of proof, the question is still asked: By what authority is it known that tuberculosis is not an hereditary disease but is one that must always be acquired after birth by being inoculated with the bacillus of tuberculosis?

To the true scientist, this question appears absurd. But the fact that the question is propounded proves conclusively that there is still doubt in the minds of some as to the true nature of tuberculosis. Therefore, at this time, when science is exerting her best efforts to elucidate every phase of disease, and when the health authorities are making honest efforts to prevent the spread of disease, the medical profession should have a clear conception of what the disease is, how it is acquired, and how its spread can most effectively be prevented.

While tuberculosis is found, as it is, in almost every family from the Atlantic to the Pacific, and from pole to pole, it naturally disturbs the whole United States and, in fact, the whole earth's population, when the scentific world stamps tuberculosis as a non-inheritable disease and proves conclusively that it is truly contagious. Added to this, comes the suggestion to institute vigorous methods for its extermination from the human race, which still further excites the indignation of the community at large.

All this, however, does not alter the facts as to the methods by which tuberculosis is developed, nor as to the means and methods by which it is possible to exclude tuberculosis from those not yet infected. While it may be hard for the lay mind—in fact, for some in the ranks of the medical profession—to give up the old theory that tuberculosis is inherited as a disease *per se*, nevertheless, it is the duty of the medical profession, acting as the true guardians of the public health and welfare, to bow gracefully to scientific advance and to accept the undeniable facts as they are announced by those who have the skill and opportunity to establish the fundamental truths in relation to the etiological factors of disease.

That tuberculosis is not an inheritable disease, is established by defining what tuberculosis really is and by demonstrating the conditions or factors necessary for the production of the specific pathological lesions which are now recognized by all leading pathologists as tuberculous in their nature.

For the development of tuberculosis, three conditions are essential:

First: An alteration in the chemico-physiological transmutation processes of the animal economy, so that the true nutritional changes are brought to a point considerably below the normal standard.

Second: Some local injury by which an inflammatory action is excited and those deteriorated nutritional processes are still more reduced, until a protein pabulum is produced at some point in the system which is favorable to and will support the growth and development of this particular definite vegetable micro-organism, named by Professor Koch bacillus tuberculosis.

The first condition, and nothing more can be inherited.

The favorable soil for the growth of the bacillus of tuberculosis can be acquired, quite as well as inherited, but for the actual production of tuberculosis a *third* factor is absolutely necessary, to wit: the inoculation of this new and favorable soil with some living tubercle bacilli from a previously infected individual, or source.

Its most frequent source is the human species. But the experiments carried out by the British Tuberculosis Commission definitely prove that the bacilli found in certain human cases are capable of producing in cattle a disease clinically indistinguishable from tuberculosis of the bovine type. Furthermore, typical bovine bacilli were discovered in several cases of tuberculosis in men. While Koch and others have claimed that the human species is not susceptible to the bovine type of bacillus, the consensus of opinion at the present time is that tuberculosis can be produced in the human species through inoculation with bacilli of bovine origin.

Its acquisition from the bovine source, however, is very much less frequent than our health authorities are inclined to proclaim. In fact, it is rarely acquired from this source.

At this point, the question arises as to how the bacilli gain access to this favorable soil. This is best answered by the following extract, taken from Professor Brooks' recent work on pathology[1]: "The distribution of tubercle bacilli and their entrance into the human body take place, on the one hand, by inhalation (aerogenous infection)—sputum containing bacilli becoming dried and then bacilli entering the respiratory passages along with rising dust—and, on the other hand, through the agency of oral secretions containing bacilli, ejected by tuberculous subjects during speaking, coughing, etc."

According to Aufrecht, the route of invasion in pulmonary tuberculosis is by the way of the tonsils and of the lymphatic glands.[2] "Furthermore, infection may occur through the gastro-intestinal canal—in-

[1] Brooks, H. T.: Text-Book of General and Special Pathology, F. A. Davis Co., Philadelphia, 1912, p. 438.

[2] *Berliner Klin. Woch.*, 1910, No. 40, p. 1829; quoted in Brooks' Pathology.

cluding the oral cavity (tonsils, diseased teeth)—by ingestion of material containing tubercle bacilli (milk, etc.); also through the urogenital canal during coitus; and, finally, through the visible mucous membrane (conjunctiva) and the skin in localities which have been injured or perhaps deprived only of epithelium in contact with parts upon which tubercle bacilli are present."

"Inoculation tuberculosis is not rare. Here belong tuberculoses of the skin of the hands of individuals who handle tuberculous material, and cases of tuberculous infection of wounds, e.g., of the prepuce after ritual circumcision, and tuberculous infection of the female genitals through coitus."

When tubercle bacilli have entered the human body in this manner and have given rise to infection, the process is at first entirely local. Further extension is due to increase or the dissemination (metastasis) of the bacilli in the body.

These facts alone do not prove that tuberculosis is not inherited, because it would appear to be within the range of possibility for the living bacilli of tuberculosis contained in the tubercular tissue of the mother to pass through the placenta to the fetus in the uterus. If this were proved to be the method pursued universally, or even in a moderate number of instances, then tuberculosis could be inherited, but even then it would be by direct inoculation from the mother to the offspring *in utero*. Repeated and extensive observation and research in thousands of cases, however, have failed to discover a single well-authenticated instance in the human subject in which the bacilli of tuberculosis were to be found in the fetus *in utero*, or in its tissues within the first week after birth.

That the bacilli of tuberculosis rarely, if ever, pass from the mother through the placental tissue to the fetus *in utero*, is explained by the fact that the growth and development of the embryo and fetus is one of the most complicated and perfect processes in nature. Every step in the developmental act is guarded most perfectly and each step is kept at the highest point of nutritive activity. This is often accomplished, however, at the expense of the mother's inherent nutritive vitality. Thus the placental tissue is maintained in a nutritive condition which is incompatible with the growth or passage of the bacillus of tuberculosis from the maternal to the fetal tissue, and the fetus is protected absolutely against infection from the mother. It is also true that actively tuberculous subjects are little likely to become pregnant, and if the tuberculous process is limited and circumscribed there is comparatively little danger of the bacilli reaching the placental structures, consequently there is practically no chance of the mother infecting the fetus *in utero*.

In this manner it is established, so far as bacteriological research has

advanced our knowledge, that tuberculosis is not and cannot be transferred from the mother to the offspring *in utero*, and consequently tuberculosis is never inherited. In fact, a faulty nutritive activity is much less frequently inherited than is commonly supposed, but the perfect product as it comes from the uterine cavity degenerates rapidly when it leaves the guiding hand of Dame Nature and is entrusted to the care of the too often ignorant and misguided parent and nurse.

What a convincing argument for the truly scientific physician to try in all his work to imitate as closely as possible the laws of nature rather than those artificially established by man? As the weeks and years advance, the nutritive vitality of the human organism progressively deteriorates, local inflammations are excited, the proper soil is developed, and finally the non-tuberculous system is successfully inoculated with the bacilli of tuberculosis, and the lesions which are characteristic of true tuberculosis are developed. These anatomical changes have never been found in the human organism until after the fourth week of extra-uterine life has been passed. The frequency with which they are found increases yearly from five-tenths of one per cent. up to the fifteenth year, when the maximum of thirty per cent. is reached. Therefore, the assertion is justifiable that tuberculosis, as such, is never inherited, but is always acquired after birth. The most that can be inherited is a definite chemico-physiological activity, and this occurs much less frequently than is commonly supposed.

The chemico-physiological deterioration is more often developed during the first few weeks of extra-uterine life. The local injury, the inflammatory processes, the development of the favorable soil, and the final inoculation which the tubercle bacilli, all come later, or after the fourth week of extra-uterine life, the greatest danger of inoculation being reached at the fifteenth year.

Dr. Southworth, in his recent inaugural address before the Medical Association of the Greater City of New York, on February 16, 1914, called attention to the great strides that have been made in safe-guarding the child from deterioration and infection between the first month and the fifth year. He further pointed to the fact that from the fifth to the fifteenth year the child is sadly neglected. He indicated that the liability to a lowering of the nutritive processes and any infection with tubercle bacilli is, if anything, greater than in the past. Once this decade of life is fully safeguarded against a deterioration in its nutritive activity, as is now the first five years, a very decided reduction in the number of tuberculous cases will be fully apparent, and not until this has been accomplished can it be expected.

In some instances, a whole family of children may be inoculated and die, one after another, at various ages, and still later one or the other of the parents may succumb to a fatal tuberculous inoculation. Such in-

stances in no wise prove that the children inherited the disease from their parents, but the foregoing facts elucidate perfectly all those obscure clinical phenomena here instanced.

Thus, it is proved conclusively that there is a well-founded theory regarding tuberculosis and one which does not defy natural laws. It is found also to fit all conditions, to explain perfectly all cases, and therefore it should be vigorously enforced at all points, if perfect protection against the spread of tuberculosis is to be secured.

While it is impossible to exterminate tuberculosis as perfectly as theory would indicate might be possible, it is still within the range of high probability to prevent the development of hundreds of thousands of cases of tuberculosis every year. Its accomplishment, however, is to be effected along the line of the prevention of a soil suitable to the growth of the tubercle bacilli rather than to over-strenuous efforts to prevent inoculation. The health boards are moving in the right direction, and they should receive the individual support of the members of the profession in every practical attempt which they make to enforce scientific methods for the prevention and spread of diseases of all kinds. The profession should no longer try to shirk responsibility and delude itself with the old idea that tuberculosis is inherited and not acquired, and for that reason little amenable to prevention and treatment. To call tuberculosis communicable instead of contagious is simply begging a scientific question. The sooner the profession and the laity recognize the inevitable fact that tuberculosis is a directly contagious disease and should be dealt with as such, the sooner will it be possible to educate the community up to that high scientific standard that must be acquired before the most perfect prevention of tuberculosis can be made thoroughly practicable. This once attained, the terrible destruction of life by this wide-spread malady can be successfully arrested.

When people as a whole have grasped the true problem and understand fully the cause of tuberculosis in the right light, and especially the methods by which tuberculosis is developed, it will be a comparatively easy task to teach them how to prevent the deterioration of the system which makes possible the successful inoculation of tuberculosis from one individual to another. Too much stress has been laid upon the infection, and too little attention has been directed to preventing the production of a soil that will sustain the life of the bacilli after inoculation. This learned, as it should be done, every one will quickly appreciate the danger from inoculation and will willingly follow all practical directions for the prevention of tuberculosis.

All this accomplished, a decided decrease in the number of deaths from tuberculosis should follow year after year, while now the actual number of deaths credited to tuberculosis is increasing.

46 West 83d Street.

VOLATILE SUBSTANCES ISOLATED FROM TUBERCLE BACILLI CULTURES AND THEIR EFFECTS ON EXPERIMENTAL TUBERCULOSIS.

BY ERNEST ZUEBLIN, M.D.,

BALTIMORE, MD.,

Professor of Medicine, University of Maryland,

and

FREDERICK PROESCHER, M.D.,

PITTSBURGH, PA.

[From the Pathological Laboratory of the Allegheny General Hospital of Pittsburgh and University Hospital of Maryland.]

A few years ago we happened to observe a peculiar tuberculin reaction in a patient from the Tuberculosis League Hospital in Pittsburg. This patient, who helped as orderly in the laboratory, complained of headache and general malaise every time when old tubercle bacilli cultures were destroyed. About the same time two friends, whilst sterilizing old tuberculin bottles, happened to work in a closed room. After a short stay in the steamy, pungent atmosphere, both friends were obliged to go to bed, suffering for several days from intense fever, chills, headache, general malaise (constitutional tuberculin reaction). The symptoms passed off within a few days without any further consequences. These particular observations suggested the following experiments, with the aim to detect any volatile substances escaping from tubercle bacilli cultures, and the following method was resorted to.

A thousand c.c. of four week old human tubercle bacilli cultures (glycerin broth) were poured into a long necked distilling flask (capacity 3 liters). Into this mixture an angulated glass tube was introduced which reached to the bottom of the flask. Through this connection a constant steam current was passed into the culture fluid. Another bent glass tube with a bulb (to prevent the passing over of solid substance from the flask) made the connection with the condenser. A small gas flame under the big flask maintained a temperature of about 37-40°. The product of the distillation was condensed and the distillation continued until the pungent odor of the medium had disappeared. The distillate itself, a slightly opaque fluid, showed a whitish precipitation after standing. The entire distilled fluid was treated with ether in a funnel separator, the extract filtered through a dry filter paper and the filtrate

evaporated on a water bath. As a residue a thick, brownish yellow oily substance of a pungent odor was obtained. This substance, regardless of frequent solution in ether and subsequent evaporation, did not crystallize. With ether, ethyl and methyl alcohol, a yellowish fluid was obtained. The substance could not be taken up in water nor in a physiological salt solution, which property would indicate a lipoid character. A faint reaction with potassium ferrocyanide and acetic acid was produced with the original distillate, no precipitation with either concentrate nitric or diluted acetic acid, nor a biuret reaction could be obtained (protein substance).

The volatile substance, stained with carbol fuchsin, proved to be acid fast and resembled the fatty substance extract from tubercle bacilli treated with benzyl chloride. For the biological test, the oily substance was dissolved in methyl alcohol and injected into a series of tubercular guinea pigs as follows:

Guinea Pig No. I. Jan. 16, 1911, weight 590 gm.; injected intraperitoneally with 0.05 gm. human tubercle bacilli. It lost in weight only during the first week after injection. On Feb. 5th, it was injected with methyl alcoholic residue from the distillate.

It became stupid and did not eat for 24 hours. After this time it gradually increased in weight until it weighed 650 gm. on March 17th, after which it declined and died April 9th, thus living 83 days after infection; total loss in weight 120 gm.

Autopsy.—Hemorrhagic fluid in peritoneal activity; peritoneum thickened and injected; mesentery glands enlarged, caseous degeneration; a few tubercles the size of a pin-head in the mesenterium. Liver enlarged; several miliary tubercles on its surface. Spleen enlarged; several miliary tubercles on the lower pole. Pleural cavities filled with hemorrhagic fluid. Lungs hyperemic; on section many miliary and submiliary tubercles, especially in lower lobes. Diaphragm studded with numerous tubercles; a few tubercles in the ligamentum latum.

Guinea Pig No. II. Jan. 16, 1911, weight 765 gm.; injected with 0.05 gm. human tubercle bacilli. The animal lost 45 gm. during the first two weeks.

Feb. 6th it received the same treatment as guinea pig No. I. After one day of illness it gained 70 gm. during the next two weeks, then fluctuated until May 12th (weight 735 gm.), after which it gradually lost. June 9th it was reinfected with 0.01 gm. human tubercle bacilli, after which the loss of weight was more rapid and the animal died spontaneously on July 13th; weight 440 gm.

The animal lived 143 days after first infection; total loss in weight 325 gm.

Autopsy.—A small ulceration at site of injection; several tubercular nodules on underlying peritoneum; four tubercles on the posterior aspect of peritoneum. Inguinal and mesentery glands enlarged. Liver enlarged; several grayish nodules in the right and left lobe spleen enlarged. Kidneys pale. One small tubercle on the diaphragm. Several tubercles on the median and posterior surfaces of both lungs. Bronchial glands enlarged. Pleura and heart without change.

Guinea Pig No. III. Jan. 16, 1911, weight 530 gm.; injected intraperitoneally with 0.05 gm. human tubercle bacilli. It lost 90 gm. in weight when on Feb. 10th, it was injected with the methyl alcoholic solution.

It increased and weighed 515 gm. on May 26th, then lost 45 gm. between that time and June 19th, when it was reinfected with 0.01 gm. human tubercle bacilli. The animal continued to gain in weight until it died July 14th, 190 days after the first infection. The total gain in weight was 35 gm.

Autopsy.—Some cloudy fluid in the abdominal cavity. Parietal peritoneum covered with tubercles, intestines and omentum without change. Spleen hyperemic. Liver enlarged; one small yellowish nodule on the lower surface of the right lobe. Several small gray nodules in the region of the xyphoid process. Several caseous tubercles on the median and posterior aspect of the lower lobe of the lungs; less involvement in the upper lobes, the middle lobes slightly involved. Diaphragm, heart and pleura without change.

Guinea Pig No. IV. Jan. 16, 1911, weight 585 gm.; infected with 0.05 gm. human tubercle bacilli. Feb. 16th it had lost 125 gm. when it was injected with the above described solution. The four days following the animal was very sick, lost in weight, but recovered and reached its maximum weight by May 26th. Then it began to lose, and by June 19th had lost 68 gm. It was reinfected with 0.01 gm. of human tubercle bacilli. It then gained 90 gm., but owing to unfortunate circumstances the animal was not observed longer.

Control Guinea Pig. Jan. 16, 1911, weight 320 gm.; injected intraperitoneally with 0.05 gm. human tubercle bacilli. At the time of its spontaneous death, 50 days after infection, it had lost 40 gm.

Autopsy.—Peritoneum, especially the paries posterior, covered with many tubercles the size of a millet seed. Mesentery glands enlarged. Several miliary tubercles on the liver. Spleen greatly enlarged; several miliary tubercles on the spleen. Lungs infiltrated with many tubercles. Bronchial glands enlarged. Pleura and pericardium without change. Several tubercles on tubes and broad ligaments.

Control Guinea Pig for reinfected animals Nos. II, III, IV of Series I.

Guinea pig infected on June 12th with 0.01 human tubercle bacilli. Initial weight 550 gm. At death 520 gm..; lived thirty days after infection.

Autopsy.—A cheesy mass the size of a hazelnut in the abdominal wall. Inguinal glands enlarged and caseous. Peritoneum covered with many tubercles. Mesentery glands enlarged. Five caseous tubercles on liver. Several tubercles on spleen. Kidneys and intestines without tubercular involvement. Numerous tubercles, partially conglomerated, on both upper lobes of lungs; numerous tubercles in the middle lobe and the median and posterior part of lower lobes. Bronchial glands enlarged. Pleura without change.

Guinea Pig No. I, Series II. March 21, 1911, weight 645 gm.; injected with 0.01 gm. tubercle bacilli. April 25th it had gained 60 gm. when it was injected with 1 cc. of the methyl alcoholic residue. It lost 70 gm. during the next three days, and between this time and June 12th, it gained 45 gm. It was then reinfected with 0.01 gm. human tubercle bacilli, gained in weight (its weight being 800 gm.). After another injection of methyl alcoholic solution on Oct. 9th it lost 10 gm., and was reinfected on Nov. 20th with .01 gm. human tubercle bacilli. The animal was still alive on Jan. 31st, having lost 30 gm.

Guinea Pig No. II. March 21, 1911, weight 580 gm.; injected with 0.01 gm tubebcle bacilli. Its weight remained stationary until treated with same amount of the methyl alcoholic solution as guinea pig No. I, when it gained 55 gm. On June 12th it was reinfected with 0.01 gm. human tubercle bacilli and continued to gain in weight until Nov. 20th (its weight being 800 gm.). It was reinfected with 0.01 gm. human tubercle bacilli, and was still alive (Jan. 31, 1912), having lost 80 gm.

Control Guinea Pig for First Infection, Series II

March 21, 1911, weight 520 gm.; injected intraperitoneally with 0.01 gm. human tubercle bacilli. At death, 40 days after infection, it had lost 125 gm.

Autopsy.—A few tubercular nodules in the peritoneum and mesenterium, miliary tubercles with cirrhotic induration of the liver. Spleen enlarged; on section, many tubercles. Many tubercles in both lungs. Kidneys, heart and genitals without change.

Tubercular guinea pigs injected with the methyl alcohol solution showed a constitutional reaction, but none of the animals died. There is no doubt that we deal here with a mild specific reaction. The control animals which were infected at the same time and injected with 0.5 cc. of old tuberculin died within 24 hours.

It seems that the tubercular animals treated with volatile lipoid substance showed an increase resistance and outlived the control animal for different lengths of time:

Guinea Pig No. I 33 days, being treated 21 days after infection.
Guinea Pig No. II 148 days, being treated 25 days after infection.
Guinea Pig No. III 190 days, being treated 25 days after infection.
Guinea Pig No. IV 144 days, being treated 25 days after infection.
No. I showed greater pathological changes than the control.

In regard to reinfection, it seems a single treatment does not in all instances give permanent immunity to tubercular infection. No. II lived one day longer than the control. During the reinfection the loss in weight was 90 gm. in comparison with 125 gm. of the control animal. After reinfection it gained 110 gm., while the control lost 125 gm.

Guinea pig IV lived longer than the control and gained 80 gm. The pathological lesions also show less involvement in No. II than the control. A more favorable result is noted in No. III which outlived the control for a longer time.

The most favorable result was obtained with guinea pigs of series II, Nos. I and II. The animals treated with a second injection of the distillate outlived the second reinfection, whilst the control animal died, affected with miliary tuberculosis. Further experiments along this line will be made.

From these few experiments it may be concluded, that in the tubercle bacilli there is contained a volatile substance chemically of a lipoid nature, which possesses a much stronger penetrating odor than the original tubercle bacilli culture. The chemical nature of the substance and the presence of a volatile protein split product (suggested by the ferrocyanide test) must be ascertained by further, more extensive investigations.

In literature we find a few reports of acute intoxication which resulted from the emulsification or evaporation of tubercle bacilli culture—Ochlecker (Untersuchungen über chirurgische Tuberkulosen, tuberkulose Arbeiten aus dem Kaiserl. Gesundheitsamte, 1907, Heft 6, S. 110), emulsified moist tubercle bacilli culture and was seized with a slight chill, rise of temperature to 102° and general malaise. These symptoms wore off after 24 hours. According to his observation certain strains produce these symptoms more easily than others. This statement with regard to intoxication (dull headache, drowsiness) was confirmed by Much. Further proof of such a possibility was added by

Leschke (Vergiftung mit den Riechstoffen der Tuberkelbazillen. *Medizinische Klinik*, 1911) who worked in Much's laboratory. His experiences can be briefly mentioned as follows: After several hours of work with tubercle bacilli culture he experienced drowsiness, general lassitude and was obliged to go to bed. In the course of several hours, intermittent chills, temperature of 102°, headache, general malaise, restlessness, psychic disturbances, confusion of ideas, excitability without hallucination: in brief, symptoms of acute amentia were present. These manifestations continued for 12 hours with the exception of headache, which persisted for several days.

According to our interpretation, we believe that underlying these manifestations is not a simple intoxication, but probably combined with it there must be a hypersentiveness, because the symptoms seem to be more pronounced in individuals giving a marked tuberculin reaction. So far no definite explanation for the cause of these morbid manifestations has been offered or attempted. Rosenau (*Journal of Medical Research*) claims that anaphylactic symptoms follow the injection of condensed expired air, from a human being, into a guinea pig, which previously was sensitized with human serum. His opinion is that certain split products of the protein molecule are volatile. If such is true, the growth of microorganisms on artificial mediums would produce volatile split substances from the protein molecule during metabolism. For such a proof extensive experiments would be required.

Vasilescu (*Centralblatt für Bacteriologie und Parasitenkunde Originale*, 1909-1910, Vol. 53) was the first who distilled tubercle bacilli culture, and first detected in the clear, colorless distillate an odor similar to that of tubercle bacilli: 5 c.c. of the distillate injected into rabbits and guinea pigs, caused a fall of temperature of .5° C. This reaction lasted only 5-6 hours. A decrease in weight of 50-80 gm. within 24 hours after the injection was noticed. A number of rabbits were reinjected, they showed the same loss in weight, and after a third injection about 20 per cent. of the animals died. In healthy guinea pigs by the same injection of 10 c.c. as well as 5 c.c. of the distillate, the same result could be observed.

If we have reason to admit the possible formation of volatile split products in growing tubercle bacilli, the exact chemical and biological qualities of these bodies require more experimental work. The question also remains undecided whether these substances are akin to tubercular toxin, and whether they are identical with those bodies which produce the hypersensitiveness.

In reporting our results we know that experiments on a larger scale are necessary, and although the question has not yet passed its experimental stage, it might in the future give the basis of a treatment by inhalation of a definite amount of these chemical substances to tubercular

patients, in cases where a mild reaction is the aim of the treatment and where hyperdermic tuberculin administration cannot be given.

807 St. Paul Street.

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THE ACTION OF LECITHIN UPON TUBERCLE BACILLI AND ITS RELATION TO EXPERIMENTAL TUBERCULOSIS.

BY ERNEST ZUEBLIN, M.D.,

AND

FREDERICK PROESCHER, M.D.

[From the University of Maryland Hospital, Baltimore, and the Pathological Laboratory of the Allegheny General Hospital, Pittsburgh, Pa.]

Koch's discovery of tuberculin opened a new field for a specific treatment of tuberculosis, although the expectations that were aroused were not fulfilled completely. After a time of skepticism and discouragement, many investigators pursued the line of thought expressed by their master, so leading up to new ideas and a better understanding of the aims of a specific treatment. In the course of the passing years we have learned about the complex nature of the tubercle bacillus. As seen from the work of Deycke and Much (*Muench. med. Wochenschr.*, 1909, No. 39; *Med. Klinik*, 1908, No. 40); Much (*Muench. med. Wochenschr.*, 1912, p. 685) the tubercle bacillus is thought to consist of four different substances, namely, proteids, fatty acids and lipoids, neutral fat and the toxin itself, which substances have all an important influence in the course of the tubercular infection. Various authors in following Much's indications have succeeded in the attenuation of virulent tubercle bacilli by treating these organisms with lecithin (Much, *loc. citat.*), cholin, nuerin (G. Deycke, *Muench. med. Wochenschr.*, 1910, p. 633, No. 12; Much, *ibid.*, 1910, p. 1093, No. 20; Ditthorn, *Berl. klin. Wochenschr.*, No. 34, 1910; Lindemann, *Ztschr. f. Immun. Forsch. u. Experiment. Therap.*, Vol. vii; Leschke, *Beitr. z. Klin. d. Tuberculose*, Vol. xx, H. 3, 1912; K. Meyer, *Ztschr. f. Immun. Forsch. u. Experiment. Therap.*, Vol. xv, H. 2-3; *Muench. med. Wochenschr.*, 1912, p. 379). According to these investigators even a complete bacteriolysis was obtained. Compounds of cholin, borcholin (enzytol) had a similar effect (H. Mehler and Ascher, *Muench. med. Wochenschr.*, 1913, p. 748, No. 14). Trichlorethylene besides nuerin, as well as other strong basic ammonia compounds (Aronson, Berl. Med. Soc., July 7-13, 1910, ref. *Muench. med. Wochenschr.*, 1910) also caused a bacteriolysis, as well as organic and inorganic acids (Much, *Muench. med. Wochenschr.*, 1911, p. 507; E. Leschke, *ibid.*, p. 598; *Beitr. Klin. d.*

Tuberculose, Vol. xx, H. 3, 1912). The latter substances were found more suitable for the immunizing action of the split products obtained.

In a previous study upon the influence of fresh and autolyzed organ extracts on experimental tuberculosis (Charles William White and E. Zueblin, *Jour. Infect. Dis.,* Vol. viii, No. 2, March, 1911) we reached the conclusion that bovine tubercle bacilli underwent an attenuation when treated with autolyzed organ extracts. This action was especially noticeable with lung extract, less for liver extract. It was also possible to demonstrate in the autolyzed fluid the presence of cholin (a split product of lecithin). At the same time tubercle bacilli left in extract with the autolyzed fluid lost their acid fastness and became granular.

The present report is a continuation of our study and deals with the morphological and biologic changes of the tubercular virus when treated with lecithin. Our study can be divided into categories:—

(*a*) The staining properties of human, bovine and avian tubercle bacilli treated with mixtures of lecithin.

(*b*) The biological qualities of human and bovine tubercle bacilli after treatment with lecithin.

Staining properties of human, bovine and avian tubercle bacilli treated with mixtures of lecithin. In the report the following technic was resorted to.

1.5 gr. tubercle bacilli were mixed together in a sterile mortar with 2 ampules of lecithin (Billon). The mixture was subdivided in 3 equal parts into sterile ampules. These ampules were kept for one-half hour at 70 respt. at 50° in the water bath. After that time they were incubated with the 3d unheated portion at 37° and left in the thermostat for three successive days. After the lapse of that time one 0.7 c.c. of each ampule was injected intraperitoneally, as recorded in the second part of our experiment. Before this was done, untreated tubercle bacilli were stained according to the usual laboratory method and compared with smears made from the contents of the ampules. The staining method consisted briefly in the following:

1 c.c. carbol gentian violet with 4 c.c. of carbol fuchsin were mixed, and with that stain the preparation on the slide was steamed for two minutes. The excess of stain was then thrown off, the slide immersed into Lugol's solution, left in contact a few minutes, then the slide was decolorized with a mixture consisting of alcohol 50%, aceton 50%, nitric acid 3%. After decolorizing had been carried out to the point that all excess stain was removed, the slide was washed in running water and counterstained with methylin blue.

The slides were also stained according to Ziehl's method with the same result. It seemed, however, that with the above-mentioned carbol gentian violet and fuchsin stain the morphological and tinctorial changes were more distinct.

Normal, untreated human tubercle bacilli treated in that way showed the characteristic fast properties of the bacillus without the presence of any degenerate forms as the granules indicated by Much.

In the preparation made from the lecithin mixtures, however, such degenerate forms were noticed, particularly in the human tubercle bacilli, so f.i. H 37 on several slides presented a few normal stained red bacilli. Most of the remaining organisms, however, presented a loss in the acid-fast quality made. In some instances only unstained protoplasm remained, which surrounded the thick granules occupying the centre of the organisms. At a later stage the pink color had changed into purple, and even a few purple granules were the only remnants of the tubercle bacilli. Such a character was found more pronounced in the slides prepared from H 50. These changes were more pronounced a few days later from the smears prepared from the mixtures incubated.

Bovine tubercle bacilli treated in the above indicated manner presented at a temperature of 37° not such pronounced changes. The majority of the organisms maintained their acid-fast character; only a few granular or purple stained forms could be noticed. That change was more pronounced on the slides prepared from B. 50, but campared with the human strain treated similarly the changes were never so pronounced. Avian tubercle bacilli were treated in a similar manner and they also presented the granular aspect.

From a comparison of the human tubercle bacilli with the bovine strain it would seem that the human form is more readily affected by the lecithin. This effect is more marked if the mixtures are kept at a higher temperature, and the longer they remain in contact with the lipoid substance. A portion of the lecithin human tubercle bacillary emulsion was treated with 5% antiformin solution, then washed with ether. The solution containing the fatty substances retained an acid-fast stain, whilst the bacilli did not retain the carbol fuchsin.

It seemed of interest to inoculate these lecithin mixtures into guinea-pigs, which reacted as follows:

B. BIOLOGICAL QUALITIES OF HUMAN AND BOVINE TUBERCLE BACILLI AFTER-TREATMENT WITH LECITHIN. CONTROLS FOR BOTH SERIES—(A AND B).

Guinea-pig No. 13, control. Infected with 0.1 gm human tubercle bacilli, weighed 320 gm., lived 50 days and lost 40 gm.

Post-mortem showed: Peritoneum thickened, of granular aspect, injected parietal peritoneum presents several tubercles in tubes and ligamentum, mensentery gland enlarged, several miliary and conglomerate tubercles in liver, spleen considerably enlarged with many tubercles; diaphragm, interior surface many big tubercles; lungs, several tubercles scattered over all lobes; pleura clean, bronchial glands enlarged.

Guinea-pig No. 14, control. Weighed 550 gm when injected with .01 gm. human tubercle bacilli. It lived 31 days and lost 125 gm.

Animal was much emaciated and presented at the post-mortem a caseous mass (abscess formation in the abdominal wall of hickory nut size), surface of peritoneum

uneven, granular with scattered fine tubercles. Mesentery glands, inguinal glands enlarged, no fluid in the abdominal cavity, intestines diaphragm free from tubercles, liver hyperemic with 5 caseous tubercles, spleen granular border, a few small tubercle nodules, kidneys hyperemic, glistening surface, no tubercles; lung, both upper lobes present numerous single and conglomerate tubercles; a few tubercles in the right middle lobe, single and conglomerate tubercles along the upper border of the lower lobes; pleura free from tubercles; bronchial glands enlarged, thymus enlarged, presents a few white tubercles.

(A) HUMAN TUBERCLE BACILLI.

1. *Human Tubercle Bacilli* 70° + *Lecithin.*

Guinea-pig No. 1. Before first reinfection gained after 3 weeks 115 gm., then showed slight loss in weight, 45 gm. during the first week, which loss was overcome in the following weeks. After the second reinfection an increase in weight until 2 weeks prior to exitus was noted, then a rapid loss of 250 gm. took place. The animal outlived the two control animals 110 days, and after infection remained alive 258 days.

Post-mortem: Lymph gland not enlarged, with the exception of the mesentery glands which were increased in size. Diaphragm, heart, pleura, peritoneum free from tubercular involvement. Liver enlarged, shows several yellowish and anemic patches. Tubercle infection at the border of the right lung; spleen large, hyperemic. Lungs, left lobe hyperemic, slight emphysema. Numerous patches in the right middle and upper lobe. Uterus enlarged, hyperemic, dry white fleshy lobule (2-milm.); dry, small lobule on the right corn, remaining adnexa free from tubercle involvement. The animal seemed very well, only a few weeks prior to its exitus a general decline could be noticed.

Guinea-pig No. 2. Lived 214 days, was reinfected twice, little affected by the first treatment, increased in weight 180 gm. after the first reinfection lost 60 gm., after the second reinfection became pregnant, which condition reached its normal time, but immediately afterwards a rapid decline could be noticed, and after reinfection died in 71 days. It outlived the control animal 40 days, but did not show any tubercle lesions.

The post-mortem showed the abdominal wall smooth, slightly injected peritoneum, enlarged ligaments and spleen, diaphragm, heart, lungs, kidneys and liver absolutely free from tubercle infection.

2. *Human Tubercle Bacilli* 50° + *Lecithin.*

Guinea-pig No. 3. Weight 490 gm., when injected with the emulsion, it lived 135 days. It was reinfected twice with .01 gm. human untreated tubercle bacilli on the 4th of March and on the 12th of June respectively. It lost 40 gm. during the first two weeks following the first treatment, then gained in weight 20 gm.; after the first infection a slight decline in weight (15 gm.) was observed in 2 days. After the second reinfection the animal died (shock or pneumonia?). The tubercle lesions were less pronounced than in the control animal.

Post-mortem findings: Abdominal cavity contains a few c.c. of a cloudy hemorrhagic fluid and a few yellow lumps; a fibrinous deposit over the large intestine and the great omentum were observed. Spleen and liver normal, lungs, a few spots of pneumonia in the middle and lower lobes and a few whitish yellow spots on both sides of the diaphragm; a few tubercles are found in both testicles (these organisms were already enlarged several weeks preceding death). The tunica vaginalis propria shows several tubercles.

Guinea-pig No. 4. Weight when treated with the bacilli emulsion 500 gm. The animal was little affected by the first treatment, gained in weight 65 gm. After first reinfection loss in weight of 60 gm. during the first 3 weeks; on the following 55 days

gained in weight, then declined until time of second reinfection, when a deficit in weight of 55 gm. was noticed. After the second reinfection up to his death lost ground, declined in weight (115 gm.) and died 67 days later. It remained alive 200 days after the first treatment, but 37 days after the control animal and the second reinfection. The anatomical lesions were not very much different from those observed in the control animal.

Post-mortem: Animal much emaciated, vessels of the abdominal wall injected, miliary tubercles scattered over the abdominal peritoneum, over ligamentum latum, conglomerate large tubercle noticed; peritoneal fluid clouded, hemorrhagic, a few nodules in mesentery, mesentery gland enlarged, left kidney small with smooth surface, one tubercle in the medullary substance. Right kidney of larger size, pale in aspect, two tubercles in medullary, one tubercle in cortical substance. Spleen enlarged, contains many white spots and tubercular infarction at the border. Liver, several gelatinous patches on the surface, no distinct tubercles found. The diaphragm shows a few granular spots on the abdominal surface; a few scattered tubercles on the pleural aspect; a few white nodules on the pericardium, no changes in the myocardium. Lungs show big conglomerate tubercle, a few tubercles scattered over the lower lobes and particularly along the medial border; a few tubercles in the upper lobes. The bronchial glands are enlarged; the costal pleura seems free from tubercles.

3. *Human Tubercle Bacilli* 37° + *Lecithin.*

Guinea-pig No. 5. Initial weight 695 gm., when first treated lived 288 days; loss in weight before reinfection was hardly noticeable; during the first reinfection the difference was 16 gm., after the second reinfection a slight gain took place, then a slow decline of 110 gm. It outlived the first reinfection 158 days, and it outlived the second control 128 days.

At the post-mortem the peritoneum shows injections but no tubercles; no tubercles in the intestines; the testicles are enlarged and present a few caseous tubercles; mesentery glands enlarged, mesentery itself from from tuberculosis. Liver enlarged, shows miliary tubercles of pinhead size, surface of the organ is irregular. Spleen enlarged with tuberculous infarction; kidneys, parenchymatous nephritis; diaphragm, abdominal aspect several white nodules in left pleural cavity, thickened irregular granular surface with adhesions with left lower lobe particularly posteriorly where a big conglomerated caseous tubercle is found (cherry-size); several tubercles in the other lobes are present besides hyperemia; the right lung shows less involvement and few tubercles.

Guinea-pig No. 6. Initial weight 565 gm., lived in all 197 days; was infected once and showed: Gain in weight after the first treatment without any apparent cause at the moment of the first injection. It showed only a slight difference with the initial weight, after the only reinjection a slight increase in weight, and though apparently in good health, 61 days later suddenly declined, lost 345 gm. and died 63 days after the reinjection, or 33 days after the second control animal.

Post-mortem: Showed few changes, namely—only enlargement of the inguinal glands; no fluid in the abdominal cavity and no signs of tuberculosis.

If any conclusions from the preceding experiments with human tubercle bacilli after treatment with lecithin are permitted it would seem that the organisms undergo some loss in virulence. Guinea pigs after treatment with these emulsions may be reinfected once or twice with .01 gm. untreated human turbercle bacilli; they outlive the control animal several months. These animals gain in weight and no clinical symptoms of tubercular involvement or a few pathological changes of chronic tuberculous results may be found at post-mortem. The at-

tenuation of the tubercle virus seems more complete if the lecithin and tubercle mixtures are kept at a higher temperature of 70°. The immunity against tuberculosis so acquired may be influenced by different extrinsic factors.

Overtaxing of the animals and loss of their reserve strength, repeated pregnancy at short intervals, may lower the resistance against a tubercular infection to such an extent that the animal dies from exhaustion. As seen later on, the bovine tubercle bacillus is more resistant towards lipoid bodies than the human strain.

C. EXPERIMENTS WITH BOVINE TUBERCLE + LECITHIN.

1. *Bovine* 70° + *Lecithin.*

Guinea-pig No. 7. Initial weight 630 gm., lived 56 days, during the first treatment the animal gained 16 gm. in weight. Infected 47 days after the first injection with .01 gm. bovine tubercle bacilli, a steady decline in weight took place, the animal lost in all 80 gm. when it died, 9 days after reinfection.

The post-mortem showed: Peritoneal wall injected, of granular surface with many tubercles, few cbm. of a cloudy fluid noticed, over left hypochondrium an adherent mass is found measuring 3 cm. x 1.5 x 0.5 cm. of yellowish aspect with peripheric injection of the capillaris. The large intestine is adherent with that mass. Another tumor is found in the hypochondrium measuring 8 x .5 cm. composed of granular tissue adherent with large omentum. The mesentery shows many tubercles. Liver presents several pin-head size tubercles and a few fibrinous threads. Spleen not enlarged but presents a few white spots. The diaphragm of granular aspect, a few white elevations noticed. Pleura, fluid in both sacks, in the lungs a few gelatine spots and few gray elevated yellowish tubercles scattered over the surface.

Guinea-pig No. 8. Initial weight 540 gm., outlived first treatment 77 days; it was reinfected only once at the same time as No. 7. During the first period, before reinfection, a gradual increase in weight of 80 gm. was noticed; after reinfection with .01 gm. bovine tubercle bacilli the animal declined rapidly and died 30 days after the reinfection, total difference in weight from beginning 10 gm. Unfortunately no post-mortem of that animal could be made.

2. *Bovine Tubercle Bacilli* 50° + *Lecithin.*

Guinea-pig No. 9. Lived 72 days after first treatment, was reinfected once, initial weight 620 gm.; after the first treatment the animal lost in weight 60 gm.; when it was reinfected, 33 days later, with .01 gm. bovine tubercle bacilli a slight increase in weight took place during the following first two weeks, then the animal declined rapidly, and at his death, 72 days after the first, 39 days after the second infection, the total loss was 190 gm.

Post-mortem: Animal much emaciated, in peritoneal cavity fluid present, peritoneal surface glistening, omentum thickened with a few granular nodules, inguinal and mesentery glands enlarged with a few yellowish white nodules, general hyperemia of the organ; liver of granular surface (cirrhotic) with many yellow fatty spots and tubercles. Diaphragm, several tubercles on both aspects. Lungs, many tubercles in left lobe, in the middle and lower right lobe with more pronounced involvement along the medial aspect; the right lobe shows less involvement, the trachial glands are enlarged, a few yellowish spots are noticed in the mesentery; kidneys congested but no macroscopic tuberculosis found..

Guinea-pig No. 10. Was treated in the same way as the previous number, reinfected 33 days after the first injection with .01 gm. bovine tubercle bacilli. During the

first period the animal, after at first considerable loss in weight (50 gm.), remained at the same weight. After reinfection the animal increased again, and 84 days after beginning of the experiment that animal presented its initial weight. Owing to unfortunate circumstances further observations of the animal were impossible.

3. *Bovine Tubercle Bacilli 37° + Lecithin.*

Guinea-pig No. 11. Weigher 865 gm. when it was injected with the emulsion. It lived 151 days in all. It became pregnant two weeks after reinfection and gained in weight in consequence. After parturition the animal could not be reinfected; it lost steadily and at its death weighed only 410 gm., 151 days after the first treatment.

The post-mortem showed considerable emaciation in the abdominal cavity, cloudy hemorrhagic fluid, yellow nodules covering the anterior and posterior wall; the large omentum thickened, a few nodules in the mesocecum in the mesoovarium and ligamentum latum; the kidneys pale and anemic without any tubercles on the surface nor other section. The suprarenal glands enlarged, a few gray yellowish nodules on the mesentery, liver studded with tubercle areas of anemia on the surface and of the section. Man small tubercles on the surface on section of spleen, general hyperemia of the organ. Diaphragm presents several nodules on both aspects especially on the abdominal side, surface thickened and granulated; several tubercles in the mediastinum, on the right ventricle one yellowish white nodule noticed. Lungs, lower lobe studded with tubercles, involvement was marked in the upper lobe.

Guinea-pig No. 12. Weighed 455 gm. when first injected; after a small loss during the first three weeks the animal surpassed its initial weight; 32 days later when the first infection with .01 gm. bovine tubercle bacilli took place the animal lost in weight during the first four weeks, became pregnant, after the full term the animal lost again, dropped down to 370 gm., three months after reinfection it gained again, became pregnant, which pregnancy reached its term, then the animal declined rapidly and died 218 days after the first treatment, 172 days after the reinfection, total loss in weight amounted to 35 gm. compared with its initial weight.

The post-mortem of the animal showed enlarged inguinal glands, enlarged mesentery gland, peritoneum free from tuberculosis, spleen contains many tubercles and a few tubercular infarcts. Liver enlarged with fatty degeneration, anemic discoloration show a few miliary; diaphragm shows two white nodules; kidneys free, lungs small miliary tubercles with more involvement of the left lung, enphysema, intestines and stomach are free from tuberculosis.

From this series of experiments with bovine tubercle bacilli it would seem that these animals are more suspectible to the disease; even if the animals survive the first treatment, they succumb to the infection at an earlier period. Pregnancy and weakening seem to have a predisposing rôle. The animals with 50 and 70% bovine bacilli died even earlier than those treated with bovine 37% + lecithin.

In previous series with human tubercle bacilli in most instances two reinfections brought fatal results, and in the bovine series one reinfection was sufficient to develop a fatal tuberculosis. The non-reinfected animal (No. 11) finally died, although it outlived the control for a considerable time and showed a considerable outspread of tuberculosis. In one instance no tubercle lesions were found (No. 8) but it cannot be denied that in 77 days after the first treatment, and 30 days after the reinfection, death occurred as a consequence of the treatment.

Since these experiments were started (January, 1911) several re-

ports have been published upon the favorable influence of the immunizing effect of lecithin and allied substances upon tubercular infection. So Ditthorn (*loc. citat.*) in his experiments with neurin was unable to produce experimental tuberculosis in guinea-pigs without any trace of that disease nine weeks after infection. He at the same time noticed the production of complement-binding substances in the blood serum against tuberculosis, and the bacilli treated no more developed upon the ordinary media used for such purposes. Meyer (*loc. citat.*) in his experiments noticed that antibodies were present, but that they were of a much milder action than those resulting from the treatment with the proteid antigens of the tuberculous virus. Momose (*Deut. med. Wochenschr.*, No. 22, 1913; *Muench. med. Wochenschr.*, 1913, No. 23, p. 1283) noticed that the animals were more resistant against tubercular infection. Perhaps we may be permitted to quote the impression of Deycke and Much and Leschke, who think that lecithin, neurin, cholin may exert such a destructive influence upon the tubercle bacillus that the other antigens freed from the bacillus and of a more delicate nature may be destroyed by that treatment, so that only a partial immunity may be started, which at further infection may not be efficient enough to fight the new bacillary invasion. Although we are aware that the present observations are only a small contribution to the present problems of immunization, which of course requires more extensive animal experiments, we believe that the human tubercle bacilli are more accessible to attenuation than the bovine type, as observed from the stained preparations and from the course noted in the infected guinea-pigs.

THE TOPICAL EMPLOYMENT OF TUBERCULIN

In Hydrocele and Other Serous Effusions, Tuberculous Adenopathies, and Chronic Sinuses.

BY W. WAYNE BABCOCK, M.D.,

PHILADELPHIA, PA.

Professor of Surgery, Medical Department of Temple University; Surgeon, Samaritan Hospital.

As is well known, when tuberculin or one of the derivatives of tuberculin is injected into a susceptible person, three forms of reaction may follow: First, a local reaction about the area of the injection characterized by an active and painful hyperemia; second, a specific inflammatory reaction about distal tuberculous foci in the patient's body; and, third, a general reaction characterized by elevation of the temperature of the body and general discomfort. The local reaction may be so intense as to produce local necrosis and abscess formation, while the hyperemia of the focal reaction may wash from the infected tissues toxins they contain, and thus by autovaccination intensify the general reaction. With the reaction there is an increased tissue resistance to the tubercle bacillus, so that experimentally, animals are less susceptible to tuberculous infection after the reaction. It follows that while the focal inflammatory reaction may tend to liberate isolated tubercle bacilli, the increase in the individual's protective forces minimizes the danger of such dissemination. Faint reactions may occur in patients with slight resistance or advanced disease, while violent reactions are common in patients with slight and well localized lesions and with a potentially high resistance; a sensitiveness or tendency at least, an immunity reaction. The avascularity characteristic of tubercles serves to protect tuberculous areas from the antibodies carried by the circulation. The increased vascularization associated with the focal reaction to tuberculin not only promotes direct healing, but favors the invasion of a diseased area by corrective antibodies. Much attention has been given in tuberculin therapy to limiting the secondary reactions; they have been considered undesirable or dangerous. In certain surgical conditions, however, an intense focal reaction is desirable, and while this may seem heretical to those treating only pulmonary tuberculosis, I wish espe-

cially to call attention to its value. By making the injection of tuberculin directly into a tuberculous focus, the local and focal reactions are combined and intensified, and this violent local reaction may be followed by rapid necrosis, liquefaction, and perhaps expulsion of diseased tissue from the area, or after a period of primary inflammation, vascularization, absorption, and healing may follow. Such a combined reaction we have found at times desirable, as we shall later mention in discussing the treatment of tuberculous lymph adenopathies. The sharp, local reaction following the injection of tuberculin is also of value in certain cases in which the lesion treated is not clearly a tuberculous one.

In surgical practice a violent local reaction is often deliberately provoked. Chronic sinuses not infrequently improve after the injection of strongly irritating chemicals, such as chloride of zinc, iodine, carbolic acid, or similar substances. Chronic forms of conjunctivitis are at times benefited by the instillation of jequirity, while the application of cantharides or other vesicants may produce desirable inflammatory reactions in indolent ulcers. Hydrocele and other serous effusions have long been treated by injecting iodine or carbolic acid. In the treatment of certain of the arthritides, Murphy has found the injection of the rather irritating two per cent. solution of formalin in glycerin valuable. The leucocytosis following a violent local reaction may be not only valuable locally, but may have a useful systemic influence. To this end there is the French method of treating septic conditions by producing large sterile abscesses by means of an intramuscular injection of turpentine. Not only is the local irritation produced by chemical substances of therapeutic value, but benefit may follow the local irritant action of bacteria or their products. Sarcomas and other tumors have disappeared after an attack of erysipelas, and many have observed the rapid improvement occurring in indolent varicose ulcers of the leg after an acute streptococcus infection. Several years ago, in seeking a therapeutic influence in the local irritating reaction to bacterial products, I began to experiment with an emulsion of tubercle bacilli. The action of the tubercle bacillus product was very efficient in certain conditions, and as yet we have little experience with other bacterial derivatives. Our first effort was to combat local serous effusions and our intention was first to sensitize the individual to the bacterin and then, by applying the bacterial derivative to the affected serosa, to produce a rather violent but selective inflammatory reaction. On injecting hydroceles with moderate doses of an emulsion of tubercle bacilli, we found, however, that the preliminary sensitization was often unnecessary, as in many instances a violent local reaction promptly occurred. Of course, the majority of adults are sensitive to tuberculin, but the reaction also occurred in a number of young children. Obviously, the

reaction does not prove that hydroceles are tuberculous. If reaction occurs, within a few hours after the injection the hydrocele sac becomes greatly distended, the contained fluid turbid from exfoliated endothelial cells and emigrated leucocytes, while the surrounding tissues show marked edema and the overlying skin becomes tense, reddened, and sensitive. This reaction reaches its intensity about the third or fourth day and then gradually subsides. At times there is so much local pain that the patient has to remain in bed and it is usually desirable to reduce the local tension by completely emptying the hydrocele on the second, third, or fourth day. In those instances in which no reaction follows the first injection, a second injection within the sac, made about four days later, is almost invariably followed by a sharp reaction. With the subsidence of the inflammation, in every case thus treated, we have found that the hydrocele had disappeared. Even those patients who had resisted operative or chemical injection treatments, were relieved by this simple procedure. In this method the endothelial cells exfoliate, the serous surfaces are covered with sticky exudate, so that with the removal of the fluid they adhere, the cavity of the tunica vaginalis is obliterated, and a cure results. The adjacent lymphatic spaces fill with exudate, which is gradually absorbed.

We have now used the method for several years, but in one patient only did a relapse occur. This patient was a middle aged man who had a violent and very painful reaction followed by an apparent cure, with a relapse after one year. Altogether we have found the injection of tuberculin in the treatment of hydrocele more efficient, and followed by fewer relapses, than any other of the operative or chemical injection treatments that we tried. The chief objection to the method is the painful secondary reaction, which may be so violent as to confine the patient to his bed for a number of days. This, at times, produces greater discomfort than that following one of the simpler operations.

The technic is as follows: Under aseptic precautions, a fine needle is introduced into the hydrocele sac and about two thirds of the contained fluid withdrawn. A syringe containing from five to ten mgm. of B E (emulsion of tubercle bacilli) is then affixed to the needle; after withdrawing the piston of the syringe several times until a thorough admixture with the hydrocele fluid is obtained, the contents of the syringe are finally emptied into the hydrocele sac. If a violent reaction is feared, all of the residual hydrocele fluid is then evacuated, and the patient is instructed to wear a suspensory and to report in three days or when the scrotum becomes tense and painful. At this time the skin and subcutaneous tissues are anesthetized by a one per cent. solution of a local anesthetic and the hydrocele is emptied through a fine needle. If no reaction occurs, as soon as the hydrocele sufficiently refills, so that the needle can be accurately introduced into the sac, the injection is repeated,

using twice the previous dose and not withdrawing the fluid. The secondary aspiration is to permit the sticky and inflamed serous surfaces to fall together and to adhere, and also to relieve the patient from the painful tension. It is not always necessary.

Serous effusions in bursæ we have found likewise to react to the injection: thus, housemaid's knee, miner's elbow, and similar serous effusions may be treated. In ganglion the secondary reaction may be so painful that simple rupture, as by the back of a book, or excision, is to be preferred. We have not as yet tried the method in treating effusions in the larger joints, fearing that the secondary reaction might produce ankylosis. A preliminary quantitative determination of the patient's sensitiveness to B E is desirable, but we have rarely found it convenient. Certainly it should always be determined before injecting the cavity of a joint. In one instance of marked ascites, in an aged and feeble woman, the injection was followed by alarming reaction and depression. In recurrent forms of hydrothorax the method is of value, but the dose should be accurately determined and used with caution, as the reactive capacity of such a large serous surface is great. In two cases of advanced and apparently hopeless hydrocephalus we have injected the lateral ventricles without evident improvement or reaction.

In indolent tuberculous sinuses we have applied the bacillus emulsion topically or, with advantage, have injected it into the granulation tissue lining the sinus. In this way we combine and intensify the local and focal reactions and transform an indolent and inflammatory lesion into an active and healing one. In some cases, local necrosis, but no improvement, follows.

TUBERCULOUS LYMPH NODES OF THE NECK.

The operative removal of tuberculous lymph nodes has, during the last few years, become rather infrequent. The operation was unsatisfactory because, when incomplete, other lymph nodes usually enlarged promptly, while the complete operation is difficult, somewhat dangerous, usually mutilating, and does not prevent secondary tuberculous infiltration and sinus formation from involving the skin and deeper tissues. Patients with tuberculous cervical lymph nodes usually are very sensitive to tuberculin, but in our experience violent reactions have never been harmful and have at times been followed by marked local improvement. We have injected B E into caseous lymph nodes to produce absorption or ripening. For indolent caseous glands a local reaction most intense within the gland capsule, seems to be safe and tends to precipitate rapid softening and expulsion of the infected pulp by absorption. In young children, of course, the predominant tendency is to liquefaction and expulsion. Our plan with large, evidently caseous lymph nodes that resist the usual form of vaccine treatment, is to inject

from two to twenty mgm. of tuberculin by a fine hypodermic needle directly into the centre of the mass. The local and general reactions are usually intensified. Three things may follow: 1. The reaction may be violent or slight and little change result. 2. Rapid softening, pointing, and evacuation may take place, followed by rapid healing. As would be expected, this is a common result in young children. 3. The diseased gland may be absorbed and practically disappear, leaving a slight, hardly perceptible nodule without sinus formation. From a fairly extended experience, during the past five years, with intensive tuberculin treatment in the management of tuberculous glands of the neck, we have seen no evidence of the dissemination of the disease. Unfortunately it often fails and in general is less reliable than X-ray treatment.

At times patients present themselves with unhealed sinuses after operations for enlarged cervical glands or other conditions. The local injection of tuberculin into the sinus or into the subcutaneous nodules that may be palpated, may stimulate healing.

The following cases illustrate some of the more dramatic results of this form of treatment. Unfortunately a considerable proportion of patients require other methods of treatment.

Case I. Dora P., aged thirteen years, chronic, suppurative, prepatellar bursitis of six months' duration, developing some months after injury. Drainage and various local measures and mixed treatment internally were not followed by improvement. A slough formed and profuse drainage continued. Fifty mgm. of B E were injected in the thigh above the lesion, following which the discharge stopped almost as if a spigot had been turned off. Three days later, the cavity was largely contracted, the slough had separated, and the surfaces were, for the most part, covered by healthy granulations. Twenty days later, only a dry scab remained. A second injection of 100 mgm. of B E was followed by a violent reaction and widespread erythema. Eleven months later, the patient returned with slight recurrence which promptly disappeared under two injections of fifty mgm. each of B E.

Case II. Miss D., aged about thirty years, tuberculous cervical adenitis of six months' duration; chronic sinuses following operation. Little improvement had followed various local applications and the injection of paste into the sinuses, for over four months. Twenty-five, then fifty, and finally seventy-five mgm. of B E were injected at intervals before a marked general and local reaction was obtained. This was followed by rapid absorption, cessation of discharge, and healing which remains permanent after nearly five years.

Case III. Louis M., aged seven years, spina ventosa involving the left metatarsal phalangeal joint of the right great toe with discharging sinuses of over six months' duration. Twice curetted in the hospital. Fifty mgm. of B E were injected. One week later, the sinus had nearly healed and seventy-five mgm. were given. This was followed by severe reaction, which confined the patient to bed for two days. The area promptly healed.

Case IV. W. F., aged twenty-three years, tuberculous adenitis of over two years' duration. Cervical adenectomy. Recurrent infection of the scar with marked swelling. Injections of B E were followed by marked reaction. Four days later, the area was less indurated and the swelling reduced. Six months later the patient

applied for treatment for recurrence of the swelling. To fifty mgm. of B E she reacted so violently as to be confined to bed for three days. One month later, the patient was discharged, practically cured. The last injection was over two years ago.

Case V. John L., aged fourteen years; mother died of "pneumonia" after years of chronic cough. Tonsillitis, January 28, 1911, followed by tuberculous cervical adenitis. Twenty-five mgm. of B E given February 23, 1911, was followed by well-marked local and general reaction. A few days later, the enlarged glands had almost entirely disappeared.

Case VI. Miss S., aged about thirty-three years, cervical adenopathy for about ten years. Operative excisions. Recurrent induration with partial relief from X-ray treatment. Relapse about two years later. Series of glands enlarged; one above the clavicle the size of a pigeon's egg. Injection of about thirty mgm. of B E was followed by violent reaction, from which the patient was confined to bed for several days. The glands rapidly subsided, however, although the patient refused further vaccine treatment, and there was little residual evidence of the adenopathy after six months.

Case VII. Lillie C., aged five years, cervical adenitis of nine months' duration. Had been treated by incision. January, 1910, a sinus opened. After the second injection, which contained seventy-five mgm. of B E, the sinus healed and the adjacent induration underwent rapid absorption.

Case VIII. William T., aged thirty years. Carpenter. Previous history negative. In August, 1909, tuberculous abscesses of the right arm developed and spread, and despite twenty-six incisions, failed to heal. He was in a hospital for months, and the arm was finally amputated. During the past year a painful swelling was present in the posterior middle third of the left thigh. This was twice opened and three sinuses persisted. The patient feared amputation of the leg and first came under our observation in 1910. The sinuses were curetted and injections of 100 mgm. of B E were made into the granulation tissue lining the sinuses. The patient progressively improved and was practically well for the succeeding three years.

2033 Walnut Street.

ALLEGED TUBERCULOSIS CURES UPON THE MARKET.

BY FRANCIS P. MORGAN, M.D.,

WASHINGTON, D. C.

It has been said on more than one occasion that the public likes to be fooled. No one is more inclined to believe this statement than he who studies the advertised "cures" upon the market to-day. If all the claims made for them by the promoters were true, sickness and suffering would be no more and the millennium would set in ahead of time. There are the so called cancer cures, consumption cures, headache cures, skin cures, kidney and bladder cures, rheumatism cures, asthma and hay fever cures, catarrh cures, diphtheria cures, rupture cures, "weak men" cures, habit cures, obesity cures, epilepsy cures, scalp cures, pile cures, pneumonia cures, and many others. Of late, perforce, there has been a growing tendency to label these products as remedies, or "for" certain diseases, rather than as out and out "cures," and to mask the claims by skillfully worded suggestions conveying the impression that the product will cure, without making any direct assertion to that effect. The representations, however, amount to the same thing, namely, that the medicine will do away with the affections for which it is recommended. It is to be regretted that preparations of this kind are not what they are announced to be and that disease cannot be wiped out in this simple way. The cure of diseases like those named above requires, however, in the vast majority of cases, much more than the mere giving of medicine, as those who have had experience in treating them, well know. What will suit or help one patient, will not necessarily suit or help another, and the *management* of a case is often of more importance than medicine.

It is not the purpose of this paper to emphasize the harm done by the sale of advertised consumption "cures," the loss of valuable time to the patient during which he might be receiving benefit at the hands of those best fitted to cope with his disease; the danger to the public which results from lack of proper medical supervision of patients suffering from infectious diseasess, like pulmonary tuberculosis, and the lack of adequate advice and control in the matter of promiscuous expectoration and other practices whereby these diseases may be spread among the members of the community; the depression of body and spirit resulting from the dashing of the hope of cure engendered by

groundless promises, etc. These evils are self evident. It will be rather the object to point out the essential characteristics of the schemes whereby attempt is made to deceive and defraud the credulous sick.

In general, there are two methods of placing these alleged cures upon the market. The first is through the agency of the pharmacist. Almost every one is familiar with the names and wrappers of the more widely advertised patent medicines of this class. They are given publicity through the newspapers and by means of posters, placards, and the display advertisements which are familiar sights in and around the pharmacy. The sentiment with which the sale of nostrums of this kind is regarded by different pharmacists varies. Many of them, recognizing the disadvantages that accrue to the public in most instances from the purchase and consumption of such products, are distinctly opposed to their sale and would gladly dispense with them entirely, were it not for what are considered to be business obligations resulting from the demand caused by the wide publicity given them. Others appear to have no compunctions in the matter. Between these two extremes there are pharmacists who hold every shade of opinion upon the subject. In general, however, it may be said that all pharmacists, with possibly a few exceptions, feel that on account of the keenness of competition, and for other business reasons, it is essential that they should be in a position to supply these goods to purchasers upon request. Some pharmacists, however, while willing to supply the goods upon demand, endeavor to discourage their sale to the public. One drug company in Chicago is said to have started a campaign against the sale of nostrums in general and displayed in its windows a card in advertising form bearing these words: "Please do not ask us what any old patent medicine is worth. For you embarrass us, as our honest answer must be that *it is worthless.* If you mean to ask at what price we sell it, that is an entirely different proposition. When sick consult a good physician. It is the only proper course. And you will find it cheaper in the end than self medication with worthless patent nostrums." In addition, the salesmen within were instructed to inform those who inquired for the most prominent nostrums, that they would only waste their money by purchasing them. These measures appeared to have little if any effect. The pharmacy in question was unable to dispense with its patent medicine trade, and it is said that nostrums comprise more than one third of its stock in trade to-day. This experience and others of a similar character seem to indicate that for the vast majority of pharmacists the sale of nostrums is an essential feature of the drug business, and it seems that the remedy for the nostrum evil must be sought in other directions.

The second important method of marketing nostrums for tuberculosis is to send them directly to the consumers by mail or express. Prod-

ucts furnished in this way are not found in the druggists' stock and are not advertised in the shops. To this class belong some of the most widely advertised "consumption cures" in the country. The initial advertisement is usually of small size. It appears by preference in farmers' weeklies, religious journals, and newspapers whose circulation is confined mostly to small communities or rural districts, although it is occasionally seen in the larger newspapers and periodicals. The object is merely to interest the reader and by means of extravagant statements cause him to write to the advertiser for further information. An inquiry is followed by a series of letters, couched in extravagant terms, which have for their object the sale of a remedy described in the initial advertisement. They are for the most part stock letters, shrewdly devised in typewriting guise so as to give them a personal appearance. The letters are not always of this character, however; occasionally they are personal. In this event they are generally written by masters in the art of correspondence, and instances are known where gullible patients have been induced to buy, at more or less regular intervals for a period of one or even two years, a product which practically consisted of nothing but water.

Devices known as "symptom blanks" are usually employed for the purpose of still further conveying the impression that each patient is looked after individually and each case is treated on its own merits. These blanks contain a number of questions with regard to the symptoms present. The number of questions varies from a dozen or so to seventy or eighty. The prospective purchaser is informed that from the replies submitted to these questions, an accurate diagnosis of his disease will be made. The impression is also conveyed that the case will be treated individually and that the medicine furnished will be adapted to suit the peculiar needs of the patient. It is not necessary to comment here upon the impossibility of making a reliable diagnosis from information of this kind. The degree of individual attention each patient's report blank receives can be gauged from the fact that mail order concerns doing a business of this kind sometimes receive as many as 4,000 pieces of mail matter daily.

The "diagnosis" is transmitted to the inquirer, together with information as to the cost of the treatment and urgent solicitation to purchase a supply of the remedy. If he does so, at the end of a month or at some time before the medicine gives out, he is urged to purchase another supply, and so on. If he stops and complains that he has experienced no beneficial effects, he is told that he has not taken enough and is urged to buy more. If after receiving the "diagnosis" letter, he decides not to purchase the medicine, he becomes the recipient of begging letters at intervals of about a month, their number depending upon the persistence of the advertiser. Each one is usually accompanied by a

drop in the price, so that a "treatment" originally priced at $25 may be offered at the end of six months for $2.50. Eventually, if the patient does not die beforehand, he sees the end of them. Practically the same medicine is furnished to each patient whatever the diagnosis may be.

Analysis has shown that the medicines usually contain ordinary medicinal agents, some of which are occasionally useful in combating the distressing symptoms of the disease; but so far as has yet been learned, their effect is temporary only, and they cannot in any sense be regarded as "cures" for tuberculosis. Creosote or its derivatives, and cod-liver oil, are occasionally found as ingredients. Sometimes the so called "extracts" of codliver oil are present. Not infrequently the product is represented to contain codliver oil, when in fact it contains none of this ingredient. This was found to be true in the case of a Compound Elixir of Cod Liver Oil, held out to be a cure for consumption (N. J. 598).[1] Analysis failed to disclose the presence of any codliver oil, or any active medicinal principle thereof. A product (N. J. 898), represented to be a "never failing remedy for the cure of all kinds of throat and lung affections" and "without a peer as a curative in all forms of throat and lung diseases" was found to consist of oil, about sixty per cent. (tar indicated), and an aqueous solution, forty per cent., containing morphine derivatives and some unimportant substances dissolved from the tar. No mention of the opium and morphine derivatives appeared upon the label, as required by law. A "cherry balsam" for the "cure" of "consumption" and "hemorrhage of the lungs," represented to "strike at the very root of the disease," was found to be a hydroalcoholic solution of opium, sugar, benzaldehyde, inorganic salts, and coloring matter. It contained no cherry bark extract or balsam (N. J. 1234). A notorious "consumption cure" (N. J. 1551), widely advertised and known, was found to consist of several separate preparations: 1. The medicine proper, which was found to consist essentially of morphine, cinnamic acid, and arsenic; 2, a tonic represented to contain iron among other things, but which was found to contain no iron; 3, a "cough mixture" containing alcohol, chloroform, and codeine; 4, a "mixture" consisting of a hydroalcoholic solution of alkaloidal material containing quinine; 5, tablets containing codeine.

At present the most promising hope of abating the evil appears to reside in two agencies, namely, legislation and education. Recently laws have been enacted to protect the public from the avarice of nostrum vendors, and more has been accomplished in this way within a few years than was accomplished in all of the preceding years of the history of the country taken together. The beneficial results of this legislation

[1] Notice of Judgment. Issued by the Department of Agriculture in accordance with the provisions of Section 4 of the Food and Drugs Act.

have become apparent in many ways. It has also become apparent that more effort still is needed to meet the question at issue with success, and in the opinion of many who have given close attention to the subject these efforts should be directed along the lines of securing more stringent legislation (such as an extension of the law to cover all oral, written or printed statements regarding medicinal preparations), and educating the public to understand the futility of depending upon advertised "cures." The present limits of the food and drugs act cover only the package and material accompanying it, printed or other; not advertisements, letters, and other advertising material not sent with the medicine. As long as the publication of false and misleading assertions with regard to medicinal agents is permitted, so long will it be the duty of the better educated element of the community, particularly those educated along medical lines, to set forth in every possible way the true character of worthless nostrums.

3915 Chevy Chase Heights.

THE TUBERCULOSIS HOME HOSPITAL EXPERIMENT.

BY P. BRYNBERG PORTER, A.M., M.D.,

NEW YORK, N. Y.

This brief communication refers to recent work carried on by the New York Association for Improving the Condition of the Poor in connection with a specially constructed block of tenement-houses placed at its disposal by the number of wealthy philanthropic individuals.

The report of the Association presenting a statement of the methods, results and comparative cost during the first year (1912-13) in the combined home and hospital treatment of families made dependent by tuberculosis, seems to be deserving of special attention, as the record of a new and interesting departure. In the home hospital, the "East River Homes," under the general direction of Dr. Linsly R. Williams, now deputy State Health Commissioner, 27 families, 79 members of which were tuberculous, lived in sanitary homes, had ample sunshine and fresh air, good and abundant nourishment, freedom from undue work and worry, reasonable segregation, skillful medical care, and constant nursing supervision. During the year 11 of these families, containing 23 tuberculous patients, 12 of whom were wage-earners, were discharged. Of the 11 families, 6 were rehabilitated physically, socially and economically. The other 5 had to be dismissed for persistent intemperance or refusal to take advice. The condition of these, however, was improved in consequence of the treatment received. Of the 135 persons in the hospital 54 were consumptive, and 25 suspicious cases. The results obtained with the adult patients compared very favorably with those of the best sanitoriums, and it is worthy of note that no new case of tuberculosis developed after admission. 61% of the adult patients were apparently cured, in 22% the disease arrested, and 11% were much improved. In only four cases was there no favorable progress. Three of these patients it was found necessary to dismiss for refusing to follow advice, and the fourth, who was in an advanced stage of the disease when admitted, died. In the 65 children and 16 infants treated the improvement was also most satisfactory. Of these, 18 were tuberculous, 23 were suspicious cases, and most of the others were excellent candidates for the disease. Upon admission practically all were under-developed, but at the end of six months each child had reached a weight normal for its age.

It is the belief of the Association that the remedy of social ills is just as urgent as the cure of tuberculosis, because without rehabilitation the family will continue to live under abnormal conditions resulting in recurrences and fresh developments of the disease. In every instance the families received at the Homes had been forced into poverty, and some were wholly destitute. At the time of admission the average income among the families which were discharged as rehabilitated was $6.42 a week. One of the families was absolutely destitute, and the income of two others ceased when they moved to the Homes. When they were discharged, however, the average income of the six families amounted to $15 a week. The conditions in one of these families "before" and "after" are thus described in the report:

Mrs. K., whose husband is in a State hospital for the insane, and her five children, from 10 to 18 years of age, before admission to the Home Hospital lived in a two room apartment. Their home, though bright, sunny and immaculately clean, was so congested that the mother and boys were compelled to sleep in one bed-room, while the oldest child, a daughter, had slept for years on a board and two chairs. They had very little furniture; not even a table. The women attended a tuberculosis day camp, and the family income was but $4.50; to which a relief society was adding $6 weekly. During their residence of a year at the Home Hospital the girl was able to return to work, and one of the boys who had been working, although he had not obtained his legal papers, was sent to school to complete his education; while the mother and children received the usual instruction and showed great improvement. The woman was fully restored to health. The girl, whose character was previously being molded gradually to fit the slum standard of the district in which she lived and of the egg-packing plant in which she was employed, sums up her experience by saying, "The time I spent in the Home Hospital seems like a year of heaven to me." Her whole outlook on life was changed. There is a personal daintiness and refinement of speech and manner. She has been inspired with fine ideals and a real ambition for improvement, and is now a trusted clerk and telephone operator in a hospital office. The two older boys have good positions, and the family income now amounts to about $70 a month."

The cost of the treatment of tuberculosis, as thus conducted, is found to be less than that of institutional treatment, and if the same beneficial results are obtained in the next two years the Association believes that it will have pointed out the way to an advance in the control of the disease of the greatest practical value.

128 West 84th Street.

DISCUSSION.

Dr. Linsly R. Williams, Deputy Commissioner, New York State Department of Health, said it had been a gratification to him to learn that some notice of the

work of the Home Hospital in New York had been included in the proceedings of such a representative body as the American Therapeutic Society. It had seemed to the projectors of the "East River Homes" that if some combination for the benefit of the entire family could be worked out, it would be a great gain. The question of complete control of the tuberculous patient was the marked characteristic of the experiment, and one important point was to see that the patient was not overworked. Having briefly referred to some of the special features in the construction of the buildings, he stated that the classification of the cases had been interesting. The adults were divided into three classes: (1) those with definite clinical signs, with tubercle bacilli; (2) those with definite signs, without bacilli; (3) those without any active signs. Altogether, he believed that this was an excellent scheme: one which was very hopeful, and which might be utilized with advantage in other cities.

Dr. POTTENGER, speaking of Dr. Zueblin's paper, said that some of the experiments described were such as were going to help solve some of the problems of tuberculosis. In connection with them he referred incidentally to Von Ruck's work with his tuberculo-proteins, which, he said, was of positive value. Much's work, together with many others, also was worthy of note. Tuberculins were not uniform in their action. With the protein group we would have a prompt and marked reaction, and with the lipoid group a much later reaction. He did not believe that the action of tuberculin was wholly a protein sensitization, for there seemed to be certain things militating against such a supposition. In experimenting upon animals we should always bear in mind that there was a great difference in the resistance and reaction power of animals. In either clinical or laboratory work, if we did not get the same results as certain other observers, we should not deny the correctness of such results. All that we could say with justice was that we had not obtained their results. No one was entitled to express a positive opinion on such a matter unless all the conditions were absolutely identical. Dr. Babcock's work was very interesting. He would like to inquire how young the children were whom he had treated. Very early, every individual came in contact with the tubercle bacillus. In a tuberculin the protein or the lipoid element might preponderate, and the same was true of the antibodies against these groups, but it was probable that not until all were properly combined could uniform immunizing responses be obtained. The speaker said he was unable to accept the statement made by Dr. Porter that tuberculosis is never transmitted through the placenta. The matter was one which was still under discussion, but he believed that some cases of such transmission did occur. In advanced cases of the disease, tubercle bacilli were constantly escaping into the blood; it would therefore seem possible for them to pass through the placenta. Tubercle bacilli were not all acid-fast; so that we could not be dogmatic on the subject. It was a generally accepted fact, however, that in the great majority of instances the infection was contracted after birth. He did not think "soil" mattered so much as had generally been supposed; for, regardless of soil, nearly every child came into contact with tubercle bacilli in sufficient numbers to produce infection. He had been glad to hear Dr. Morris speak of never operating upon tuberculous cervical glands. In his own experience he had had only two cases of operation in the past fourteen years. Tuberculosis of glands was not a surgical disease, and its treatment was constitutional. He could speak only with commendation of the Home Hospital treatment of tuberculosis which had been inaugurated in New York. There was no class in which so large a percentage of cures could be secured as the poor, if they were given a fair chance. Every city, he thought, must solve its own problems.

SOME PROBLEMS IN GENETICS.

BY THOMAS E. SATTERTHWAITE, M.D., LL.D., Sc.D.,

NEW YORK, N. Y.

Genetics is a branch of biology that embraces generation in all its aspects, and is deservedly attracting a great deal of attention. As physicians, however, we are more taken up with those phases of it that have to do with propagation of normal human beings and of the abnormal through procreation. Both of these topics fall, directly or indirectly, within the scope of eugenics, a branch of genetics that is especially interesting us at the present time.

The principles of both, as the latter includes the former, were first emphasized by the laborious but illuminating studies of Lamarck (1809), Wallace and Darwin (1859) on evolution; Mendel (1866) and Galton (1897) on heredity; and in this country more recently by Dugdale (1878) and Davenport, Goddard, and Rosanoff (1911-12). The data furnished by these men and others of their colaborers on these or collateral lines have served to lay down certain general principles that have been successfully applied in the hybridization of plants and in the cross-breeding of animals. But though for various reasons these principles are not as applicable to human beings as to the lower forms of life, they may properly be utilized as bases for solving problems bearing on the legal regulation of marriage and the propagation of hereditary diseases.

Certainly any reasonable person will admit that marriages concern the community at large, sometimes as much as and often more than the contracting parties. Matings of any sort should therefore be amenable to some sort of regulation, whether by moral influences, legal methods, or by arbitrary authority as in the medical departments of our army and navy. In fact, eugenics has so close a relation to the well-being of society that laboratories are devoted exclusively to its study, an international congress has met to further its interests, and legislatures have framed laws to make its teaching effective. There are many illustrations at hand to show its importance but the history of the notorious "Jukes" family,[1] familiar to many of us, gives an instructive picture of the appalling consequences of improper matings. I will merely outline it. Somewhere between the years 1720 and 1740, a hard-drinking backwoodsman of our State known to us as "Max Jukes," was the first in a family that up to the year 1877, either in direct or collateral lines, by mar-

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riage or cohabitation, numbered upward of a thousand individuals. Of these 709 were actually traced in the course of the investigation; 300 or thereabouts were computed to have died prematurely; 50 of the females were common prostitutes; 40 of the women had specific diseases, contaminating 440 persons; 60 were habitual thieves; 7 were murderers; while very many others were in various ways burdens on the State. When the inquiry closed, in 1877, it was estimated that the family had cost the State $1,308,000, or more than a thousand dollars apiece for each of the 1000 persons in whom there had been Max Jukes' blood, besides causing widespread degradation and the physical harm to the community that has been described.

The following history, however, is even more instructive, as it contrasts the results of unfit with fit matings. Back in Revolutionary times a man by the name of Martin Kallikak took advantage of a feeble-minded girl. Of their 480 descendants 143 were feeble-minded, the greater part of the number falling below mediocrity, while none of the remainder had an special ability. Later, Kallikak married a respectable Quaker girl, "of good ancestry," it is said. From this union there were 496 descendants whose histories were traced. All of these but two were normal mentally, and the two exceptions were not feeble-minded. In both the Jukes family and among Kallikak's first set of descendants the breeding seemed to be "true"; that is, the vices or defects of the parent were apparently transmitted to the majority of the offspring, while on the other hand Kallikak's marriage with the Quaker girl, after he had come to look at life from a different angle, was productive of children that were gifted with exceptionally good traits. Other somewhat similar family histories have been published, each teaching the same object lesson. But even from the recital of the two I have mentioned, the conclusion is inevitable that such calamities should in some way, if possible, be prevented, for the protection of society.

Let me now turn to another phase of this subject. As physicians, some of us have to face even more widespread results of ill-assorted matings, which, if they do not cause such obvious damages to society as those in the two families alluded to, add greatly to the sum of human misery. As we know, there are many infirmities that may be inherited, such as epilepsy, chorea, deaf-mutism, and various mental disorders A person afflicted with any one of these who mates with another similarly affected will under certain circumstances transmit them to the offspring, who will in turn hand them down to succeeding generations. In fact, Karl Pearson[2] has claimed from his study of statistics that 75 per cent. of all deaths are due to inherited diseases. If in the further study of eugenics it can be shown that this percentage is even approximately correct, it ought to arouse physicians, parents, guardians, teachers, and friends to their duties, as such, in warning the public that the

is always a greater likelihood that these diseases will be transmitted by such marriages than that they will not, certainly if Mendelian principles are correct. These dangers that Pearson has pointed out, we have, however, been in the habit of disregarding. As a matter of fact, we are often and truthfully charged with even greater offences against human eugenics, as when we bring unfit infants into the world and afterward use our best efforts to keep them in it. And we increases the numbers of the unfit in proportion as our medical knowledge and skill develop. Unfortunately, too, for human eugenics, in so far as we help in the transmission of physical and mental defects, we will continue to offend so long as legal or moral laws prohibit us from doing otherwise. We are not yet arbiters between life and death.

Take an instance of our misconduct against eugenics: Dwarfism is a family disease; that is, in the ordinary course of nature it would become extinct, but is maintained by the intervention of a Cesarean or other life-saving operation. For under ordinary circumstances mother and child would perish simultaneously. The skilful obstetrician, however, steps in: the dwarf mother's life is saved, perhaps, and in addition another dwarf may be born into the world.

At this point let me briefly take up some of the salient points concerned in the matter of heredity.

First of all, we must realize that heredity, so far as it relates to the transmission of traits in plants and animals, is a matter that is far better understood than is human heredity. Following the line of investigations pursued by Wallace and Darwin, Mendel and others, and which were begun more than half a century ago, natural or haphazard selection for the purposes of propagation in plants and the lower animals gave place long ago to artificial selection, particularly among nurserymen and breeders of horses and cattle. Flowers can now be made to take on new colors, plants new contours and greater vigor; horses by cross-breeding can in a succeeding generation develop increased speed; milch cows can in a similar way be made to generate a progeny that will yield a phenomenal quantity or quality of milk. The marvelous ability shown, our own Burbank in making new species of plants has never, I presume, been excelled, and his work is still being successfully prosecuted. But we humans very rarely have such results. We cannot control the factors. Nowadays we are seldom given the opportunity to select human mates, certainly not in this progressive country.

"Love is the tyrant of the heart; it darkens reason, confronts discretion."

Nor could we, if we would, produce a new species of the genus homo, by grafting or any such mechanical means. Having seldom a free hand, and being unable to achieve the results of the nurseryman, because of the limitations of human capacity, human eugenics as applied

to our matings has very restricted possibilities.

However, something may be done by us that is eugenical, for, if we accept the laws of Mendel, we can tell in advance what the expectation will be as to offspring in fit and unfit matings, and to some extent the relative proportion of normal and abnormal under ordinary conditions.

Gregor Johann Mendel was an Austrian monk, and he is credited with having been the first to enunciate the laws of heredity. Versed in physics, mathematics, and the natural sciences, he studied the effects of crossing various sorts of edible peas in his monastery garden. Singularly, he appears not to have been known to Darwin, though his work was done between the years 1857 and 1865. He died without having received recognition for his discoveries, which were not made public until 1900, or sixteen years after his death. His laws or principles may be briefly stated in the following general terms:

1. Every organism, from germ-life upward, contains within it an aggregation of characteristics representing the several elemental traits that have been inherited from a previous generation. Each organism is therefore made up, as it were, of a mosaic of molecular elements. Among these are certain dominating characters, called by Mendel *determinants*.

2. On the other hand, there are also organisms of the same species in which this dominant type is either absent or deficient. This sort of organism, according to Mendel, represents a *recessive* type. It is defective in respect to the elements of the dominant type.

3. If a dominant is crossed with another of the same type, the succeeding generation will all be of the same dominant type.

4. But if one of the dominant type is crossed with another of the same species which has but a single recessive characteristic, the result will be that 25 per cent. of the succeeding generation will be of the recessive type, and 75 per cent. of the dominant type, though not in the same degree. In one the grade of dominance will be marked, but it will be less in the other two.

5. Again, if one of a recessive type mates with another of the same type, all of the succeeding generation will be of the recessive type, that is, defective.

These Mendelian doctrines have been tested with reference to the feeble-minded by Goddard, as to the epileptic by Davenport, and as to insanity by Rosanoff. The latter has further elaborated six possibilities with respect to the inheritance of either a neuropathic or normal constitution in the human being, in general accordance with his interpretation of Mendel's laws.[3 4 5] Thus,

1. If the parents are both neuropathic, all the children will be neuropathic.

2. If one parent is normal, but with a neuropathic taint from one grandparent, and the other parent is neuropathic, half the children will be normal, but capable of transmitting the neuropathic constitution to their progeny, and half will be neuropathic.

3. If one parent is normal and of pure normal ancestry, and the other parent is neuropathic, all the children will be normal, but capable of transmitting the neuropathic constitution to their progeny.

4. If both parents are normal, but each with the neuropathic taint from one grandparent, one-fourth of the children will be normal and not capable of transmitting the neuropathic constitution to their progeny, one-half will be normal but capable of transmitting the neuropathic constitution, and the remaining one-fourth will be neuropathic.

5. If the parents are both normal, one of pure normal ancestry and the other with the neuropathic taint from one grandparent, all the children will be normal, but half of them will not be capable and half will be capable of transmitting the neuropathic constitution to their progeny.

6. Both parents being normal and of pure normal ancestry, all the children will be normal and not capable of transmitting the neuropathic constitution to their progeny.

The following table, which has been copied from a recently published study of heredity in insanity, based on seventy-two family histories,[5] shows the closeness of correspondence between actual findings and theoretical expectations according to the Mendelian theory:

Types of Mating According to Rosanoff's Six Types	Neuropathic Offspring		Normal Offspring	
	Actual Findings	Theoretical Expectation	Actual Findings	Theoretical Expectation
1	54	64	10	0
2	190	214½	239	214½
3	0	0	45	45
4	107	80½	215	241½
5	0	0	77	77
6	0	0	0	0
Totals	351	359	586	578

It will be noted from these tables that there is a remarkable correspondence in figures between the theoretical and actual findings; sufficient to impress the impartial reader that in respect to the neuropathic constitution, at least, transmission from generation to generation is in accordance with the Mendelian laws as here set down.

Rosanoff tells us also that about two-thirds of all the patients admitted to insane asylums have inherited the neuropathic constitution. That the converse is true has been shown in a very striking manner by trac-

ing the descendants of the distinguished theologian, Jonathan Edwards, as given by Walter.

In further confirmation of the application of the Mendelian laws, Rosanoff has tested them by the records of the Kallikak family already alluded to[6] and has found in 502 individuals traced there was a lack of correspondence between the theoretical and actual findings in two instances only. The figures cited should therefore be taken as proof that the Mendelian doctrine of heredity has very strong evidence in its favor. To disprove them one would be called upon to show inaccuracies in the tables themselves, or else that analogous ill or good results sometimes follow good or ill matings.

It is a matter of satisfaction that eugenics has taught us how a defective strain can be gradually minimized by selective matings, at least so far as physical and mental traits are concerned, the rapidity of the elimination naturally depending, *ceteris paribus*, on the excess of normal dominating germ material entering into the matings. Burbank, indeed, is very optimistic in this respect. He says that if he could only carry out in the human species the Mendelian principles, more could be done for it in ten generations than would otherwise be done in a thousand years. The inference therefore is justified that the physical and mental traits of offspring can to a certain extent be determined before birth through artificial selection.

Within comparatively recent years we have been able to isolate the infecting agents of tuberculosis, gonorrhea, and syphilis. We have also found that the gonococcus has a field of activity which is not limited to the genitourinary tract, as was formerly taught, but that it may produce a systemic disease of great danger to life. So, too, the *Treponema pallidum* of syphilis remains a powerful agent for the infection in the third stage of the disease. And it seems as if the degree of infectivity in the venereal diseases, as with alcoholics and drug habitués, is proportionate to the morbidity of the one who transmits the disease. Consequently, it is only reasonable that persons wittingly transmitting the venereal diseases should be amenable to the law. More than this, in extreme instances it is for the common good that such persons be debarred from procreation. There can be no doubt that sterilization laws such as those of Washington, California, Connecticut, New Jersey, Nevada, Indiana, and New York, if designed to prevent propagation by confirmed criminals, idiots, imbeciles, and rapists, indicate progress in the right direction. The validity of such laws has been tested in the State of Washington, where in September, 1912, a decision as to their constitutionality was handed down by the Supreme Court, the court of last resort in this State for such matters.

However, according to a report in one of our daily papers, the Iowa sterilization law passed by the General Assembly, has been declared un-

constitutional, null and void, in a decision filed June 24th of this year by Judge Smith McPherson, District Judge of the Southern District of Iowa. The opinion as stated is that "the statute is in violation of the United States Constitution in that it is in effect a bill of attainder, in that there is to be no indictment or trial; that the statute abridges the privileges and that he is denied equal protection of the laws; that he is denied due process of law; that the statute is in conflict with the Iowa constitution in that the statute denies the inalienable right to enjoy life, liberty, and to pursue and obtain safety and happiness; that there is no jury trial awarded him and that the statute provides cruel and unusual punishment."

This decision will naturally effect similar laws in other States, and the writ of temporary injunction applied for by the inmate of the State penitentiary enjoining the members of the board of parole, the warden, and the penitentiary physician from operating on him was granted.

To what extent these laws have been carried out I have not been able to discover. They certainly have met with great opposition within the ranks of both our own and the legal profession. The question is a medicolegal one. Legislation in this matter, to be effective, must appeal to our intelligent judgment; it must be reasonable in the legal sense.

Many of our State legislatures have also passed laws regulating marriage. There are such in Ohio, Washington, Connecticut, Minnesota, Kansas, Utah, New Jersey, North Dakota, and other States, and the public may be counted on to urge further action in States where there are no such laws.

At present such legislation is to a large extent ineffectual, because the contracting parties can easily cross over into adjoining States, or into Canada. Eventually, however, public opinion, the most powerful deterrent in such matters, will be aroused by the evasion of the law and will make its verdict felt in an unmistakable manner.

Unfit marriages are, as I have already intimated, not only a direct outrage on the offspring, but indirectly a crime against society, when as a result of them the unfit are born into the world. It is not a sufficient reason for neglecting such legislation, that the laws made may not adequately protect the community, for the mere fact that some sort of inhibitory legislation is on the statute books will call attention to its importance and the desirability of not infringing it. To make laws in conformity with present knowledge and requirements and then to alter them in the face of new or special conditions, as may be desirable for the public good, is sound legislation.

But we must remember that there should be no overregulation of marriage. Many will hold with McCready[7] (*Medical Record*, August 23, 1913), that "many of the individuals to whom we are indebted for whatever is best in art, music, literature, and science have sprung from

ancestors which by present-day standards would be judged unfit"; and with Groszmann[9] that "in the worst families there has been a sprinkling of perfectly normal individuals." These statements should, however, be very carefully weighed.

At all events, there should be no ill-considered, hasty, or impractical legislation. The recent Wisconsin law was very probably opposed by medical practitioners of the State because its medical provisions could not be carried out. The charge for the necessary physician's certificate as to the applicant's freedom from venereal diseases was limited by the law to $3, whereas a full examination for syphilis alone would ordinarily cost $10, and under some circumstances six times that figure, and even then no physician could affirm with absolute certainty that syphilis was absent. A law requiring such certificates will, as in the Wisconsin case, fail of its purpose. But on the whole this incident may have a salutary lesson, even if it merely calls attention to many of our modern laws which often seem to be made to be broken. Anyone who is familiar with such laws will bear me out when I say that they are very apt to be hastily conceived, badly drawn, and often hedged about with so many restrictions that they cannot be enforced.

However, the Supreme Court of Wisconsin has upheld its marriage law by a recent decision. The objections on the part of physicians were met by the extraordinary holding that even if physicians could not prevent unfit marriages, owing to the inadequacy of the allotted fees, they could at least protect society from the effects of such unions. The legal objections that it established an unconstitutional discrimination by requiring that only men must have a satisfactory record was met by an equally curious holding, that such a classification was permissible.

But notwithstanding such inappropriate legislation, the intention of the court was undoubtedly to make a move in the right direction.

And this statement leads me to say as a corollary that all legislation in medical and sanitary matters should first be passed upon favorably by medical organizations, qualified to act with authority in legislation of this sort.

Such appears to have been the course pursued by our representative in Congress, the Hon. Lathrop Brown, in the matter of the bill introduced by him, already referred to. It may be safely predicted that any such bill introduced into Congress will have little support there, at the present time, unless backed by the medical profession, through its representative bodies. Even if by any chance such a bill should pass and become a law, I believe it would prove inoperable without the concurrence of our profession.

Apropos of legislation on this subject Dr. Charles B. Davenport of the Carnegie Institute of Washington, in charge of the Station for

Experimental Evolution at Cold Springs Harbor, L. I., says that most of the so-called eugenic laws are failures.

Holding that the problem of eugenics is only to be solved by gradual processes, he says we are investigating but as yet know very little of the laws governing heredity and feeblemindedness. We have, he says, a mass of information but it is not ready as yet to be put before the public. When that time arrives sensible laws can be passed.

In concluding what I have to say on the transmission of diseases through procreation and the regulation of marriage, I do not pretend that we have all the desirable data at hand to sustain any law of heredity and explain its exceptions. We stand on the threshold of a very difficult task, which will require plenty of intellect and money and special facilities for its elucidation. This much I will say, however; I believe that Mendel's principles of laws of heredity have been established firmly enough to serve as a basis for statutory regulations whose ultimate object will be to prevent certain persons with physical or mental defects being permitted to bring into the world offspring to deteriorate it and to be a sorrow to themselves.

But this is not all. In the evolution of the ideal man or woman, we cannot stop at perfection in physical or mental traits. Eugenics halts at the threshold of life. It goes no further. And yet it is here that the most essential attribute of mankind begins to be formed. This is human character, which develops after birth into what Galton has called "civic worth." It is the result of environment and training from birth up. The infant that is born into the world with a perfect physique and a brilliant intellect will be a defective and may some time or other become a menace to society, unless character is acquired. A Plato, an Aristotle, or a Washington might be born into the world ideal in mind and body, but he would certainly be more dangerous to society than an ordinary man without the proper development of character. A nation composed of such citizens would have in it the elements of its own destruction. It would die as other nations have done; as Greece did, because the Greeks, with all of their physical beauty and intellectual attainments, lacked an essential—character. *Mens sana in corpore sano* is very desirable, but the ideal citizen should also have what Horace has described as *integer vitæ scelerisque purus*. Conversely, by superimposing on a physical defective character, one of the world's greatest leaders may be developed. We have many example to prove this. The Apostle Paul was one.

Without being either a psychologist or a neurologist, I will venture to say in conclusion:

1. That while human eugenics is still imperfectly understood, there are certain principles bearing on the transmission of traits by propagation that are tolerably well established.

2. These principles should first of all be popularized, so that the adult portion of society will realize the importance of fit and the dangers of unfit matings. With an aroused public appreciation of these matters, appropriate legislation will sooner or later follow and be made effective.

3. Uniform laws as to the regulation of marriage should be urged in every State, and also laws to prevent the transmission of diseases by diseased persons.

4. While the motto *Salus populi, suprema lex,* is true, legislators should only advocate laws that will accomplish satisfactory results without an unreasonable curtailment of personal liberty.

5. There is urgent need of further researches in the field of eugenics, in order to clear up misapprehensions and so allay criticism as to its civic value. But, as this work would necessarily involve the services of special medical experts, expenditure of large sums of money and unusual facilities, it should be relegated to the States or the general government, which could provide the men, money and opportunities, and accomplish the most at the least expense. Reports from such sources would serve admirably as bases for the framing of appropriate laws, or for the amendment of those that have proved to be unsatisfactory.

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7 East Eightieth Street.

DISCUSSION.

Dr. Edward D. Fisher, New York, said he thought Dr. Satterthwaite's paper of great value as coming from a physician, as much of the work reported had been done by men outside of medicine. It was contrary to previously accepted statistics, that defectives should be as prolific as those known to be normal. While thoroughly in sympathy with investigations along these lines, he believed that hasty conclusions from imperfect data should be deprecated. He would certainly question the correctness of the Mendelian theory. Such exactness or percentages could not be made. The old saying that statistics can prove anything was exemplified by many of the reports. We were, therefore, at present simply beginning the study of this question. We did not know enough to pass intelligently upon many of the legal measures which had been proposed, and if such statutes were enacted it would not be possible to carry them out as we wished. Their enforcement would be regarded by many as an infringement of private rights, as was illustrated in the matter of compulsory vaccination. Among the poor, however, we could regulate it to a certain extent. As to sterilization, we could not get it applied in the State of New York. Practically, it would be very difficult to decide who should and who should not be sterilized. In

this matter of genetics there would always be two parties, the believers in heredity and the believers in environment.

Dr. Spencer L. Dawes, Albany, N. Y., said that undoubtedly all were in accord with Dr. Satterthwaite as to the desirability of improving present conditions, but personally he agreed to some extent with Dr. Fisher. The facts recorded in the history of the "Jukes" family were very doubtful, and many of the statements made by Goddard as to the "Kallikaks" were regarded as incorrect and Rosanoff's as unreliable. Of the patients in the New York State Hospitals for the Insane, no less than 45 per cent. were foreign-born; though this was no doubt a greater preponderance of this element than would be found in similar institutions in other parts of the country. At the same time, in the general population of New York State, the foreign-born constituted only 29.9 per cent. The ratio of relative contribution to the ranks of the insane was therefore 1.64 to 1. In the whole United States the foreign-born constituted (at the last Federal census) 19.5 per cent. of the total population, while of the insane, 34.3 per cent. were foreign born. In the New York State hospitals in 1911, the foreign-born first admissions constituted 48.36 per cent. of the total number of those whose birthplace was ascertained. The parents of 3,519 of the 5,700 first admissions were foreign born and of 1,224 native born. 699 first admissions had mixed parentage, *i. e.*, one parent was native born and the other foreign born, or one parent unknown and the other either native born or foreign born. The parentage of 218 of the patients was unknown. The patients whose parents were of either foreign or mixed parentage constituted 74 per cent. of the whole. If only the patients whose parentage was ascertained were considered, those having foreign and mixed parentage constituted 76.9 per cent. of the whole. The first admissions with both parents of foreign birth constituted 64.2 per cent. of the patients, the nativity of whose parents was ascertained.

Dr. Charles E. Woodruff, New York, said that for the past ten years he had been making a study of types of human beings under varied conditions, and he had found that the average mortality ranged high among those whose characteristics were not adjusted to the climate in which they lived. His investigations had been principally devoted to the consideration of the matter of pigmentation in its relation to light and heat. It was well known that in this country the Irish, who were of the blonde type, were three times as prone to tuberculosis as the dark Jew, and twice as much so as the average population. It was a fact that today there was not to be found a single representative of the Spartan or of the Athenian type, which had been established with so much fore-thought and care.

Dr. A. Ernest Gallant, New York, read the following: Spermato-dok-os-tomy, or Spermatoplanic-aphoria, as suggested by Dr. Achilles Rose—sterility produced by diverting the spermatozooa from their natural channel, the spermatic ducts, into the loose, cellular tissues of the scrotum—as a means of preventing procreation among the habitually criminal and incurable of the defective classes, has proved to be, and will continue to be, a harmless, efficient and protective means to a justifiable end. Spermatokostomy, cutting the vas deferens as a protective measure when applied to criminals, was first advocated and described by A. J. Oschner, in the *Journal of the American Medical Association*, 1899, 32, 867-8, wherein, under the title "Surgical Treatment of Habitual Criminals," he describes two cases upon whom he did "Resection of the vasa deferentia on both sides through an incision less than one inch in length, just below the external inguinal ring." Dr. Harry C. Sharp, chief physician of the Indiana State Reformatory, began using Oschner's method in 1899. In 1901, he stated, "Latterly I have been following the *English method*, which selects the scrotal region as the site of operation" (*Trans. Miss. Val. Med., Assn.*, 1901, iii, 306). Sharp grasps the spermatic cord between the thumb and fingers of the left

hand, cuts down on the vas, frees it, ligates above, and cuts across the vas; leaving the *testicular* end free and open, so that the secretion may escape into the loose cellular tissues around the pampiniform plexus and from there be absorbed. In the ten years following Sharp operated on 456 cases, without anæsthesia, without dressing the wound, without loss of time; the man at once going back to his work. As Sharp succinctly puts it, "there is no atrophy of the testicle, no cystic degeneration, no disturbed mental or nervous condition following, but, on the contrary, the patient becomes of a more sunny disposition, brighter of intellect, ceases excessive masturbation, and *advises his fellows to submit to the operation for their own good.* And this is the point in which this method of preventing procreation is so infinitely superior to all others proposed—that it is endorsed by the persons subjected to it. All the other methods proposed place restrictions and, therefore, punishment on the subject; this method absolutely does not. There is no expense to the State; no sorrow or shame to the friends of the individual, as there is bound to be in carrying out the segregation idea" (*Jour. A. M. A.*, 1909, liii, 1899).

In answer to queries on vasectomy the *Journal of the American Medical Association* (1911, lvii, 1152) says: "The physiological effect of bilateral excision of a portion of the vas deferens, commonly called vasectomy, was studied on animals a century ago, by Sir Astley Cooper, and has been investigated by many others since. The unanimous report is that no (detrimental) effect whatever can be detected, except the imprisonment of the spermatozoa and consequent sterility. Both functions of the testicle—the so-called internal secretion necessary to adult masculinity, and the production of spermatozooa—continue unimpaired indefinitely. In a human subject normal active spermatozoa were found in the testis seventeen years after occlusion of the vas. Sexual power and desire continued unaffected, as they do after bilateral occlusion of the vasa by gonococcus epididymitis, and in case of congenital absence of the vasa. In the human subject, excision of the diseased vas has long been a standard measure; bilateral excision of a piece of the duct was introduced by Lennander, in 1894, as a substitute for castration as a means of relieving the ills consecutive to prostatic hypertrophy; and for several years after had considerable vogue. . . . The operation is surgically and physiologically harmless."

As Sharp has pointed out, many hundreds of men and women, now segregated, might after sterilization be set free, to earn their own living were it not that they fail to appreciate the necessity for avoiding procreation, especially among the women, who soon return to the institution, only to give birth to another generation of their own undesirable degenereartes. We cannot do better than to repeat the words of Oschner (*Trans. Miss. Val. Med. Assn.*, 1901, iii, 308): "It seems to me that when we have a means which is perfectly safe, which is unaccompanied with pain, which leaves no deformity, which leaves the patient precisely as good as before, with the exception of disabling him from inflicting his progeny on the community, the medical profession should quietly develop this subject, and I believe we could do more in this direction than we could in taking care of those who are afflicted in this way."

Dr. SATTERTHWAITE admitted that the figures given in the history of the "Jukes" family were not accepted by some people. He would venture therefore to propose that the figures should be subjected to a rigid scrutiny by either the New York State or the United States authorities. A review of these and similar histories that had been published, by experts selected for the purpose, might throw useful light on these topics, and remove errors that might have crept in. The foundation stones of human eugenics should be sound and well laid, or the superstructure could not be durable.

Dr. Woodruff said that this matter was largely a question of environment. He thought environment, not heredity, was the principal element to be considered. The criminal had had something to change his character. If he had been subjected to good influences he would have been an orderly member of the community, though very likely deficient in intellect. We could not very well trace the ancestry of criminals, but he had an idea that it was the "good" families which were sending the most people to prison. As to the sterilization of those who were known to be liable to transmit such conditions as imbecility, for instance, he believed this to be a social necessity.

Dr. Reynold Webb Wilcox, New York, said that what Colonel Woodruff had stated about families was true. In genealogies the dates of births often had to be altered to suit the conventionalities. Sterilization had its good points, but we could not breed to a type. Those who had looked up the history of the "Jukes" family had selected the black sheep, and those recording that of the Edwards family had gone into it for the purpose of picking out the good members. It had been stated, but with what accuracy was not known, that the first wife of Jonathan Edwards was born in New York. One of her brothers killed his mother, and after Edwards had married the woman he refused to acknowledge the fatherhood of the first child born. She was so bad that he finally had to divorce her; yet it was a fact that all the children of this bad wife were good and accomplished, while all the children of the second wife, who was of unblemished character, were mediocre. The first wife no doubt had a dominant strain (according to the Mendelan theory), which passed into her progeny. It was necessary, therefore, that we should look into the history of the bad, as well as the good. The idea of a eugenic immunity was not true. The criminals came from the normal families in the community. The families of the four gunmen recently executed at Sing Sing were not criminals. There was one class of people which had not been fairly treated, the feeble-minded. The general opinion was that these unfortunates should receive the same care as the insane and the imbecile; yet it was a fact that in the State of New York only 4,000 out of the 19,000 in the State, were now under custodial care. He believed that this society should recommend such legislation as would correct this condition. In the British Parliament a proposal had been made that all feeble-minded persons should be placed in the care of the State.

In accordance with the suggestion of Dr. Wilcox, a motion was made and carried that a committee of three should be appointed to consider the advisability of the Society's taking action in regard to the feeble-minded, and report at the next annual meeting.

THE APPLICATION OF SOME MUSCULAR TISSUES ADAPTED TO PHYSIOLOGIC STANDARDIZATION. STANDARDIZATION OF ERGOT AND PITUITARY PREPARATIONS.

(Continuation of a Previously Reported Study.[1])

BY F. E. STEWART, PH.G., M.D.,

PHILADELPHIA, PA.

Professor of Materia Medica and Botany, Departments of Pharmacy and Chemistry, Medico-Chirurgical College,

AND

P. S. PITTENGER, PH.G., PH.C., PHAR.D.,

PHILADELPHIA, PA.

Instructor in Pharmacodynamics, Departments of Pharmacy and Chemistry, Medico-Chirurgical College.

In a paper read before the American Therapeutic Society last year we presented the results of our investigations into the subject of standardizing ergot by means of its effect upon the isolated uterus. After a brief discussion of the principal objections to the uterine methods formerly employed, we described in detail a method and apparatus which we had devised for testing ergot upon the isolated uterus of the virgin guinea-pig. The paper was supplemented by charts showing the increased sensitiveness and accuracy of the new method as compared with the old ones. Attention was also called to the variation in uteri as to power and muscular structure and to the means of distinguishing active from inactive uteri.

During the past year we have devoted considerable time to a study of the possibilities of employing this method for other purposes.

The marked sensitiveness of the method together with the concordant results obtained by its employment led us to believe that through it we could perhaps ascertain whether or not the uterine and circulatory actions of ergot run parallel to one another. This is an important factor, since the blood-pressure method is rather extensively used for standardization purposes, its employment being supported by statements that the characteristic effect of ergot is a stimulation of all unstriped muscle tissue of the body, and that the changes in the circulation, in the intestines, and in the uterus are but a part of one general action. The employment of this method has been further supported

by the fact that all the substances which have been suggested by various writers as being the active principles of ergot have produced stimulation of the blood vessels as well as of the uterus. So far as we are able to learn, however, no experimental results have ever been published to show whether or not these two actions run parallel.

We are, therefore, now testing every sample of ergot submitted for assay by both the uterine and blood-pressure methods. By this means we shall be able after a sufficient number of samples have been tested to compare the results obtained and thus determine whether or not a parallelism does exist between these two actions. If one completion of the experiments the results show that all the samples which assay high by the blood-pressure method also assay high by the uterine method we shall know that these actions do run parallel. If, on the other hand, some samples run high by one method and low by the other we shall know that such a parallelism does not exist.

In order to express the activity of the preparations and percentages it is necessary to adopt some provisional standard with which to compare the unknown preparation. After much experience we have adopted the following standard for the blood-pressure method:—

"0.08 c.c. of the fluidextract per kilo, intravenously injected into a series of two or more dogs, should cause an average rise of blood-pressure of 30 mm."

Preparation.	*Comparative strength by B. P. method.*	*Comparative strength by uterine method.*
No. 1 F. E.	166%	170%
No. 2 Cornutol	100%	90%
No. 3 F. E.	153%	148%
No. 4 F. E. 5 months old	51%	100%
No. 5 F. E.	224%	230%
No. 6 F. E.	210%	198%
No. 7 F. E.	118%	105%
No. 8 F. E.	80%	100%
No. 9 F. E.	125%	135%

In order that the results obtained from the uterine and blood-pressure method may be compared we have also adopted a fluidextract of ergot of the above strength as the standard for the uterine method. After a fluidextract has been adjusted to the exact strength above stated, it is placed in 4 c.c. vacuum ampoules to prevent deterioration.[2] These can then be opened and used as required.

The foregoing table would indicate that a parallelism does exist between the action of ergot upon the circulatory system and the action upon the uterus. We shall be unable, however, to arrive at a definite conclusion until more data have been compiled; therefore, our investigations along these lines will be continued for another year.

The ever-increasing popularity of the pituitary gland as a medical agent induced us to next direct our attention to methods of standardizing this body.

The rôle which the pituitary body or hypophysis plays in life has until recently been a mystery. It was at first thought that its function was to lubricate the nasal cavities. This belief, however, was soon discarded and replaced by the supposition that the gland was, like the appendix, of no use at all. Later, however, it was proven by Vassale and Sacchi,[3] Caselli,[4] and others that the gland plays a very important rôle and is absolutely necessary to life. It has also been found that acromegaly and other diseases are due to functional disturbances produced by this gland. The similarity between the histologic characters of the anterior lobe of the pituitary and the thyroid has suggested that the pituitary supplied a secretion. This view, defended by Rénon, Launois, Cushing, and others, is the prevailing one. Sajous claims, however, that recently recorded data, together with the facts that an extract of the glandular lobe, the anterior, is inert, while extracts of the posterior or neural lobe, which is not glandular, are alone active, tend to invalidate this view. According to Sajous,[5] the pituitary is not the source of a secretion, but functionally a nervous organ which co-ordinates the activities of the thyroid and adrenals. When toxics of certain kinds occur in the blood they excite the pituitary body and through this organ increase the production of thyroid and adrenal secretions, to which Sajous and others have attributed antitoxic functions. The effects of pituitary extract are ascribed by Sajous[6] mainly to the presence of epinephrin, which, as shown by the chromaffin test, is present in the posterior lobe in firm organic combination.

The knowledge concerning the chemical structure of the pituitary gland is, however, still in its infancy and has only recently gained proportions sufficient to warrant the hope that science will ultimately be as successful in isolating an active principle or principles from this gland as it has been with the suprarenal gland. Owing to the similarity existing between the physiologic actions of the pituitary and those of the suprarenal gland, the theory has been advanced that the active principle of the former will be very similar to epinephrin. In fact, it has been shown that the active principle of the gland can be concentrated into a basic fraction forming salts with acids. Führer,[7] however, has demonstrated that this basic fraction can be split into several fractions. Schäfer and Vincent[8] had also shown some time before that the blood-

pressure-raising principle could be divided into two fractions through the different solubilities of the latter in alcohol, one fraction possessing a pressor and the other a depressor action. These facts would tend to prove that the action of the extracts of the pituitary body is due not to the action of one, but to the combined actions of several active principles.

The pituitary body varies in size according to the age and species of the animal. The gland most commonly used in therapeutics is that obtained from the ox, and is about ¾ inch in diameter.

The gland is composed of two parts or lobes,—the anterior and the posterior, or infundibular. The smaller, or posterior, lobe, which forms only about 10 to 15 per cent. of the total gland, is the more important therapeutically. This lobe contains practically all of the active principle, while the anterior lobe is the one which is so necessary to life.

The total pituitary body contains about 80 per cent. of water, or, in other words, 100 parts of the fresh gland yield about 20 parts of dry substance, containing 2 to 3 parts of the posterior lobe.

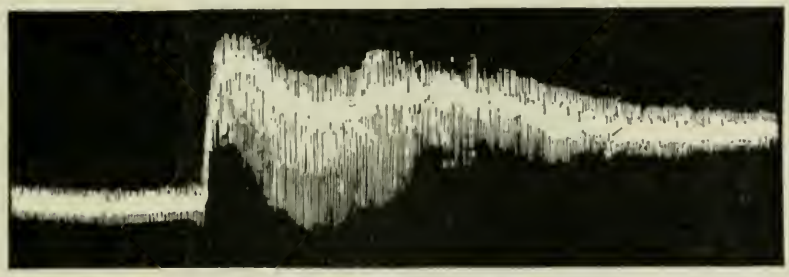

Fig. 1.—Effect of pituitary extract on the blood-pressure. (*From Pittenger's "Biochemic Drug Assay Methods,"* P. Blakiston's Son & Co., Publishers.)

This gland has become of great interest to the physiologist and clinician. The discovery of P. Marie[9] in 1886 that the disease known as acromegaly is associated with pathologic changes in the pituitary has been followed by other discoveries in relation to the pituitary body that are epoch-making. Oliver and Schäfer[10] in 1894 found that intravenous injection of aqueous or saline extracts of the entire organ produces a marked rise in the general blood-pressure, not so great as in the case of epinephrin, but more prolonged. The action is peripheral and is due mainly to constriction of the arterioles. Magnus and Schäfer[11] and Schäfer and Herring[12] have shown that it accelerates diuresis. Howell demonstrated that its pressor effect is obtained only from extracts of the posterior lobe and that the anterior lobe is physiologically inactive; also that the action is directly on the heart and blood-vessels and not through the autonomic nervous system. The investigations of Dale,[13] Cramer,[14] von Frankl-Hochwart and Fröhlich,[15] and others prove that it

causes marked uterine contraction. Ott and Scott[16] found that it exerts a marked galactagogal action. Schäfer and Mackenzie[17] confirmed the findings of Ott and Scott (1910). They used a dried extract made from the posterior lobe and proved that the galactagogue substance is not present in the pars anterior. An extract of the pars anterior seems to have some stimulating effect upon the sexual development, according to Götsch. Hendley[18] finds it a valuable aid in shortening the long and

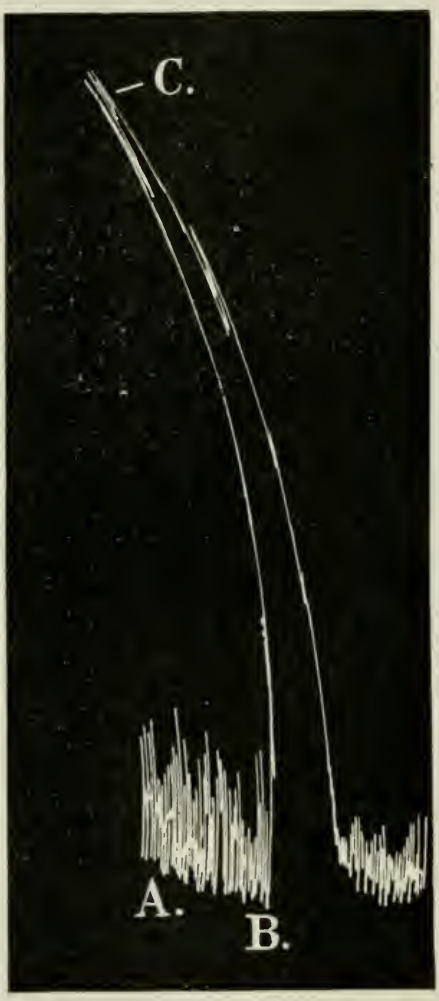

Fig. 2.—Effect of pituitary extract on the isolated uterus: *A* to *B*, normal; at *B*, 0.01 c.c. of pituitary extract was added. (*From Pittenger's "Biochemic Drug Assay Methods,"* P. Blakiston's Son & Co., Publishers.)

often exhausting first stage of labor, especially in "dry" labors. He also refers to it as a powerful remedy in shock and collapse from prolonged

chloroform anesthesia. It acts as a calmative in excitement in labor occurring in patients of nervous temperament. It prevents postpartum retention of urine, and it controls hemorrhage.

Frey and Kumpiess[19] state that extract of pituitary prevents postpartum retention of urine. It inhibits urinary flow when first injected, this effect being followed in a few hours by a reactionary polyuria. There is also a relative increase in sodium chloride excreted.

Ebeler[20] finds pituitary extract invaluable for the treatment of retention of urine during the puerperium or after operations. This action is exhibited only when the bladder is full. He, therefore, waits sixteen to thirty-six hours after the last micturition before giving an intramuscular injection. When the bladder has emptied itself retention is not again experienced.

Vogt[21] gives the extract in the treatment of postpartum hemorrhage and also as a prophylactic. He finds, moreover, that it aids in the normal separation of the placenta and is of service in retained placenta after miscarriage.

Every valuable drug has some untoward effects and limitations, and it is not surprising that a drug of so much potency is capable of producing harm if not skillfully employed. The following summary, relating to its untoward effect, is taken from the Journal of the American Medical Association, May 2, 1914, where it appears under "Queries and Minor Notes," page 1421. In answer to the question, "Have any bad results on either mother or child been reported from pituitary extract?" the editor says:—

"Stern,[22] Bagger-Jörgensen,[23] and Spaeth[24] report cases of atony of the uterus. Nagy,[25] Spaeth,[26] Malinowsky,[27] and Lieven[28] report cases of impairment and slowing of the heart tones and asphyxia of the fetus. Schneider-Sievers,[29] Calman,[30] and Voigts[31] report cases of collapse, ringing in the ears, and dizziness. Nagy,[32] Schneider-Sievers,[33] and Toepfer[34] report cases of eclampsia. Mackenrodt,[35] Patek,[36], Rieck,[37] Hamm,[38] and Heil[39] report cases of contraction of the dilated uterus. Hamm,[40] Voigts,[41] Mackenrodt,[42] and Malinowsky[43] report cases of tetany of the uterus, and Voigts[44] reports a case of premature expulsion of the placenta. Rieck[45] reports a case of tetany of the uterus following the use of a pituitary extract and concludes that it is not to be recommended as an oxytocic in the home. E. Herz[46] reports a case of rupture of the uterus under pituitrin. Grumann[47] reports complications following the injection of pituitrin consisting of a rectocervical fistula produced by prolonged pressure of the head (for two hours). The mother survived. The child died of sepsis. H. B. Sheffield[48] reports a case of toxic convulsions in the child shortly after birth, in which pituitary extract was used, which disappeared on taking the infant from the breast.

He attributes this trouble to pituitary extract which had been secreted in the mother's milk."

Standardization of Pituitary Extracts.

The brief historical review given above, together with the condition under which the product is now marketed, namely, in dose ampoules, the strength of which is not properly defined, demonstrates very clearly the necessity for standardization if uniformity in dose and physiologic effect is to be insured. The scant knowledge of the chemical composition of the gland renders it impossible to ascertain by chemical means the comparative value of two or more extracts or fractions. It is, therefore necessary to resort to physiologic assay methods.

There are three physiologic methods of standardization, namely, the actions of the drug upon blood-pressure, upon the uterus, and upon the kidney.

Blood-pressure Method for Standardizing Pituitary Extracts.[49]

"*Apparatus Necessary for Experiment.*—A large kymograph with manometer arranged for taking blood-pressure tracings on continuous rolls of smoked paper, accurately graduated all-glass syringe; large and small scalpels; small, sharp-pointed scissors; tenaculum; bulldog clamps; small glass cannula; silk ligatures, and a dog board.

"*Animals.*—Various animals may be employed, the dog, cat, or rabbit; but dogs of medium weight (8 to 14 kilo) give the best results.

"*Preparation of Experiment.*—First completely anesthetize the animal. Any of the volatile anesthetics may be employed, but since it is of great importance that the blood-pressure does not fluctuate from the action of the anesthetic, it is better to employ the morphine-acetone-chloroform anesthesia as follows:—

"Inject subcutaneously 0.01 Gm. of morphine sulphate per kilo body weight of animal, and forty-five to sixty minutes later give by mouth 1.5 to 2 Gm. of acetone-chloroform (1.5 Gm. for animals weighing 6 to 7 kilo. 2 Gm. for those weighing 10 to 12 kilo, and intermediate weights accordingly). The carotid artery is then exposed and connected with the mercurial manometer. Next an incision about 2 inches long is made over the saphenous vein at its junction with the femoral vein, and the tissues are severed just enough to free about 1 inch of each. These veins are used for making the injections.

"*Actual Standardization.*—After all preliminary arrangements have been completed about 0.05 c.c. of the standard extract should be injected into the femoral vein. If this produces a rise in blood-pressure less than 24 mm. (12 mm. as recorded by the U-shaped manometer) the dose of the standard extract should be increased. If, on the other hand, the injection of 0.05 c.c. produces a rise of more than 40 mm. the dose should

be decreased, as large doses markedly influence the succeeding injections. (See Fig. 3.) After the 'standard dose' of the standard solution is thus determined a 'standard dose' of the unknown solution is injected and the rise in pressure compared with that produced by the standard solution. If the difference is very great the unknown solution is strengthened or diluted as the case may be. The size of the injection is then increased or decreased until that dose of the unknown solution is found which will cause the same rise in pressure as that produced by the 'standard dose' of the standard solution. Occasional injections of the standard solution should be made to show the variation in the reaction of the animal, due to the effects of previous injections. Final equality is secured by injecting alternately a standard and the unknown solutions until the average rise of several consecutive injections is practically equal.

"The fact that the blood-pressure method involves the simplest technique, together with its satisfactory and almost universal use as a means of standardizing epinephrin and suprarenal extracts, would at first lead one to believe that this method would also be the most satisfactory one for standardizing pituitary extracts. It has, however, serious disadvantages in the latter case. As before stated, the blood-pressure-raising principle can be divided into two parts, one possessing a pressor and the other a depressor action. Prof. Fühner,[7] of Freiburg, has also shown that the sum of the basic principles tested by him caused marked uterine contractions and only a slight pressor action, which was almost completely masked by a marked preliminary depressor action.

"Furthermore, extracts which had been deprived of their depressor action by fractionation with alcohol showed marked pressor effects,

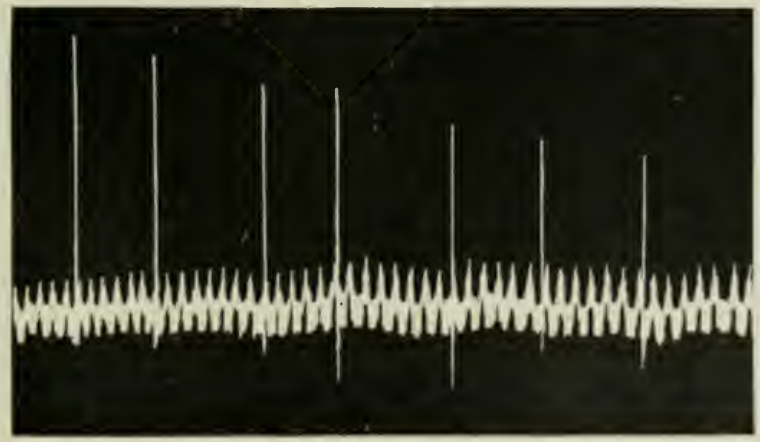

Fig. 3.—Shows the gradual decrease in the rises in blood-pressure produced by repeated injections, of equal size, of pituitary extract. (*From Putteuger's "Biochemic Drug Assay Methods,"* P. Blakiston's Son & Co., Publishers.)

while on the other hand, they were sometimes almost entirely free from action on the uterus.

"Another serious drawback to the blood-pressure-raising method is the fact that the active principles of pituitary extract are not nearly as rapidly oxidized as those of the suprarenal gland and therefore repeated injections of equal sizes produce unequal rises, the subsequent ones generally showing a waning of the pressor action and an increasing prominence of the preliminary depressions.

"Still another objection to the blood-pressure method is its comparatively low sensitiveness; in other words, it requires, in most cases, a rather large variation in the size of the injection to produce a variation in the resultant rise. This latter objection is especially serious when comparing two or more samples for research purposes, in which case a mistake of 20 to 30 per cent. in interpreting the results of an assay may cause a considerable loss of time. The greater sensitiveness of the uterine method is shown by Figs. 4 and 5, which show the results obtained from tests upon both the blood-pressure and isolated uterus methods, in order to determine which was the better of two pituitary extracts made by different processes. According to the blood-pressure method both extracts showed the same activity, while when tested by the uterine method, which is far more sensitive, 8 minims of one extract proved to be more active than 12 minims of the other.

"It has been shown by Dale and Laidlaw that *methods of standardization based upon the diuretic action of pituitary extracts* are also unsatisfactory because of the tolerance produced by the first injection. They state that if small doses are used in order to overcome this tolerance 'it may be difficult to distinguish genuine effects from the spontaneous

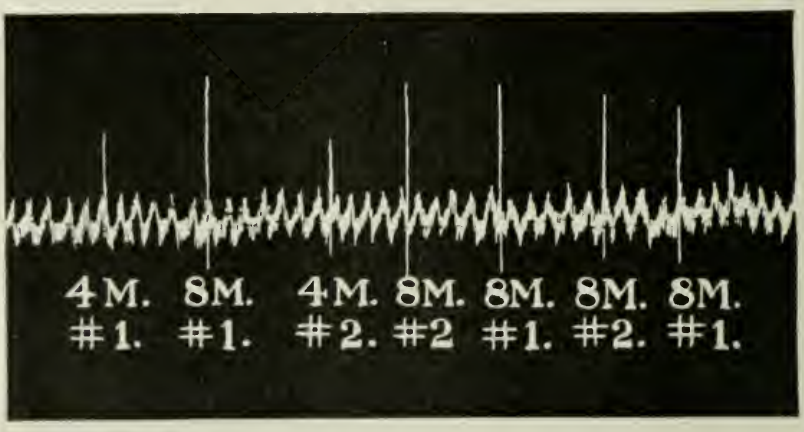

Fig. 4.—Tracing showing equal rises in blood-pressure from equal amounts of the two extracts of pituitary mentioned above. (*From Pittenger's "Biochemic Drug Assay Methods,"* P. Blakiston's Son & Co., Publishers.)

variations of urinary flow which occur in almost any experiment, however constant the controllable conditions.'

"The unsatisfactory results obtained by these methods led us to carry out experiments in order to determine whether or not the isolated uterus apparatus devised by us for testing ergot would be equally satisfactory for assaying pituitary extracts. The results of these experiments prove this apparatus and method to be even better adapted to testing pituitary extracts than for testing ergot. The details of the test follow.

"*Isolated Uterus Method of Standardizing Pituitary Extracts.*—The action upon the isolated uterus has, in the hands of most workers, proven to be a very satisfactory method of valuating pituitary extracts.

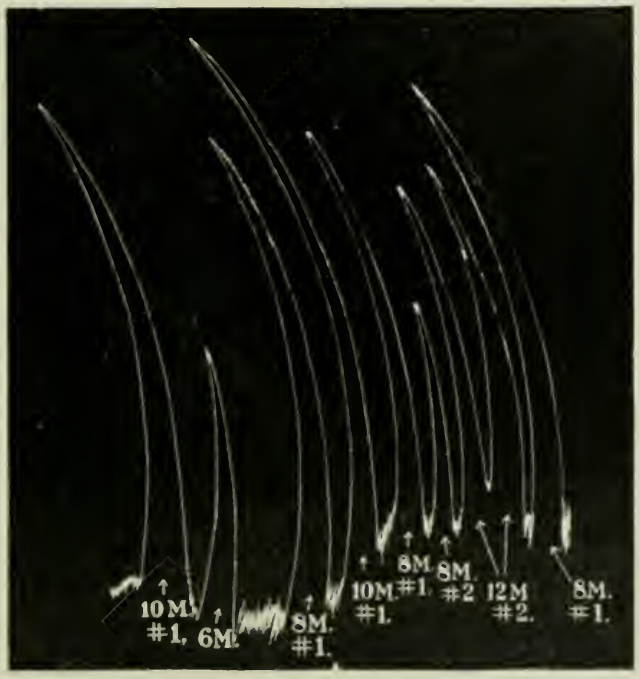

Fig. 5.—Tracing proving the sensitiveness of the uterine method. Chart shows 8 minims of extract No. 1 to be stronger than 12 minims of extract No. 2. By the blood-pressure method (owing to its lower sensitiveness) both preparations show the same activity. (*From Pittenger's "Biochemic Drug Assay Methods,"* P. Blakiston's Son & Co., Publishers.)

By this method a small uterine muscle is suspended in a comparatively large volume of oxygenated Ringer's solution, which can be readily removed and replaced by a fresh volume. This gives a much better chance, than presented by other methods, for the tissue to recover its original condition by the rapid washing out of the principle or the reduction of its concentration to below the threshold of activity.

"*Apparatus Necessary for Experiments, Animals, Method of Injecting, Preparation of Experiment, and Technique.*—Same as described in introductory paper presented last year under the heading 'Isolated Uterus Method for Standardizing Ergot.'[1]

"*Preparation of Standard Solution.*—Due to the variation in susceptibility of the different uteri, this method must essentially be comparative and not absolute. This necessitates the adoption of an arbitrary standard with which the activity of unknown can be compared.

"This is a point on which some generally acceptable convention is ultimately to be desired, but further experience with the conditions of stablity is needed before any definite recommendation can be given. Schäfer and Herring state that the fresh infundibular substance, dried at a low temperature, is indefinitely stable, and it may be that ultimately a freshly prepared decoction of such a dried material will prove to be the best standard of reference. But Schäfer and Herring's statement was evidently based on general impression—the effects produced, that is to say, did not become obviously weaker on the average. The question is by no means a simple one, for no absolute reference exists, on the one hand, which can be with certainty reproduced, while, on the other hand, the available methods of evaluation are essentially comparative. The variation in the responsiveness of different individuals, or different isolated uteri, is very wide, so that neither the minimal effective dose nor the magnitude of response to a dose of standard size gives any useful information. For the present we use as a standard the extract prepared by a brief boiling of the perfectly fresh and finely pounded infundibular material with a definite proportion of acidulated water, so as to produce a 10 per cent. or 20 per cent. extract of the fresh moist substance. The extract is then sterilized by brief autoclaving in small phials. Some activity is lost in autoclaving, but the preparation thereafter has great stability. The use of small phials, of which one can be used for each test, obviates repeated sterilization, which is inadmissible. At frequent intervals a new batch is chosen which has an activity equal to or just perceptibly greater than that of the former standard, so that the possibility of a very slow lowering of the standard is eliminated, though we have as yet no evidence of deterioration under such conditions (Dale and Laidlaw).

"*Actual Standardization.*—After the uterus has been placed in the apparatus and has attained the condition of uniform low tonus, a small dose (about 0.01 c.c.) of the standard extract is pipetted into the Ringer solution in which the uterus is suspended. If all conditions are ideal the uterus, which was recording small, rhythmic contractions, will now forcibly contract and record its contraction by a long, sweeping curve. The dose should be sufficiently large to produce a nearly but not quite maximal tonus. If this initial dose of the standard extract produces a

maximum tonus the drugged solution should be quickly removed and replaced by fresh Ringer's, after which a smaller dose is tried. If, on the other hand, the lever after rising to a position of partial tonus falls again and a wide rhythm ensues, the dose is too small. In such cases the solution should be changed and after about ten minutes at minimal

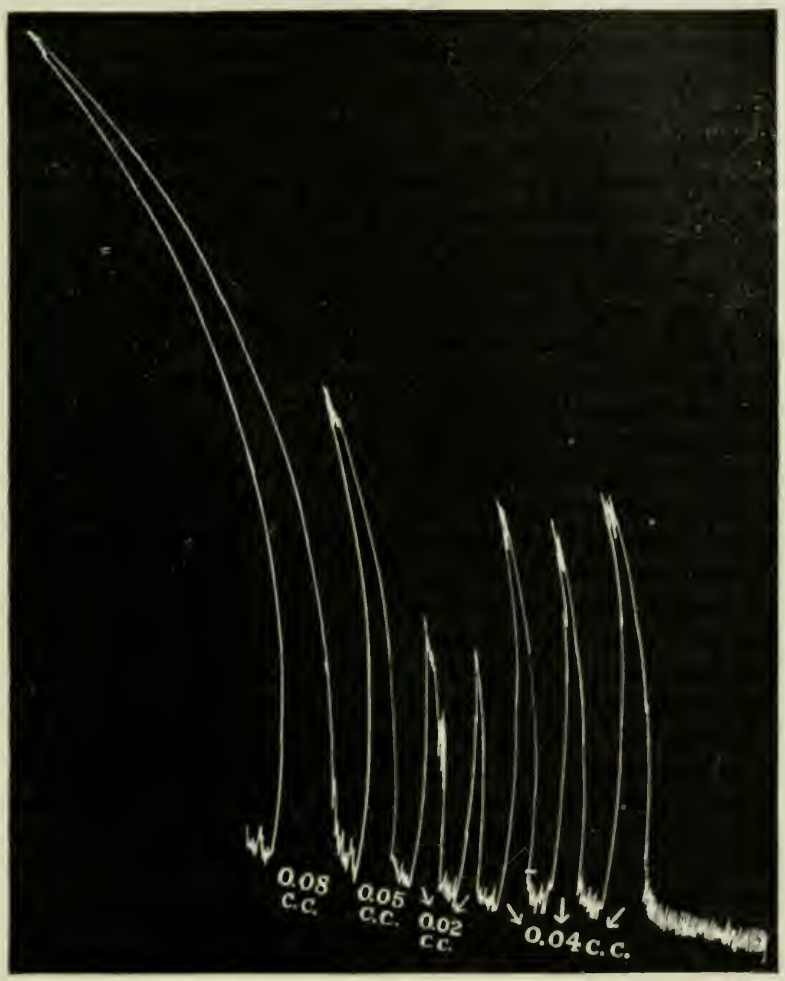

Fig. 6.—Demonstrates the concordant results obtained from repeated doses of an equal amount of pituitary extract. (*From Pittenger's "Biochemic Drug Assay Methods,"* P. Blakiston's Son & Co., Publishers.)

tonus larger doses should be tried. If, however, doses of 0.03 c.c. do not produce tonic contractions, the uterus should be discarded and replaced by another. After thus determining the 'standard dose' of the standard extract, a 'standard dose' of the unknown extract should be given and the resultant contraction compared with that produced by the

standard extract. If the difference is *very* great the unknown solution is strengthened or diluted accordingly. The size of the injections is then increased or decreased until that dose of the unknown is found which will cause a contraction of an amplitude equal to that produced by the standard. Occasional injections of the standard solution should be made to insure constancy in the reaction of the uterus. Final equality is secured by injecting alternately the standard and the unknown extract until the average amplitude of the curves produced by several consecutive injections is practically equal.

"It is not necessarily significant that there occur a slight variation in the amplitude of the curves produced by two successive doses, as a second equal dose of the same preparation will frequently give a contraction of slightly greater amplitude than that produced by the first dose, or may, on the other hand, produce a slightly smaller one. The uniformity of result is more nearly complete with some uteri than others. The uniformity depends to a considerable extent on the *uniformity of interval between the doses,* so that the first dose of a group, either at the beginning of the experiment, or at a later stage following a prolonged interruption, tends to produce a slightly abnormal result in one direction or the other. The succeeding doses, however, generally give concordant results. On the other hand, it is inadvisable to give a long series of doses at short intervals, as this produces a gradual decline in the sensitiveness of the uterus. It is advisable, therefore, when making a series of comparisons, to give a group of four or five doses at about ten-minute intervals, then allow an interval of about one-half hour or so and then follow with another group, regarding the first member of each group of curves as probably abnormal. Good uteri will give reliable results for eight to ten hours after being excised and placed in the oxygenated Ringer solution

"This method is by far the best so far proposed for the standardization of pituitary extracts, as differences of activity which are only just appreciable by the blood-pressure method, under the best conditions, are at once obvious in the test on the uterus without any special care in controlling the regularity of the response."

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PARAGEUSIA AND ITS TREATMENT.

BY THOMAS F. REILLY, M.D.,

NEW YORK, N. Y.,

Professor of Applied Therapeutics, Fordham University.

The term parageusia was coined by Warden, in 1889, to cover the complaint of bad taste experienced by the patient when there was no material in the mouth to account for it. The term has been used by three or four writers since that time to designate a similar condition. Most of us have so long associated the complaint of bad taste in the mouth with digestive disorders that we have been overlooking the fact that it is quite often an expression of diseased conditions other than those originating in the gastroenteric tract. Another reason that it is overlooked is because the sense of taste is so largely a subjective phenomenon that we have no means of measuring its intensity or character. "There is no accounting for tastes" is an old saying, and it is frequently a very difficult thing for a patient to convey to us by means of language just what the taste that he experiences, resembles. In passing, it may be mentioned that one must not confound herewith the bitter and acid regurgitation which patients often call bad taste—because these eructations leave a bad taste in the mouth for a short time after regurgitation.

During the past year I have questioned between 500 and 600 patients; 1, as to the presence of this symptom, 2, as to its constancy, and, 3, as to its character. It was present in 180 of these patients; 105 complained of it only as a transitory phenomenon, seventy-five complained of it as a more or less constant symptom for weeks, sometimes months. In attempting to arrive at some conclusion, I selected five tastes which are intelligible practically to every one and used them as a basis. Occasionally a very intelligent patient will have noticed some slight modification, but inasmuch as all of these tastes are appreciated by every one, I believe they will form a working basis: 1. Bitter (gall), olives; 2, sour, acid; 3, salt; 4, sweet; 5, coppery; 6, iron; 7, metallic; and, 8, pappy or flat. Physiologists say that there are only four tastes appreciated by the tongue and that other tastes are largely olfactory, but undoubtedly these four latter are present subjectively and are independent of the sense of smell.

No special part of the tongue or mouth was affected; the taste was in all cases general. A few stated that it was more marked about the teeth. Sometimes the sense of taste as avoked by pressure, e. g., causing the tongue to be pressed against the roof of the mouth increased the intensity of the taste. Curiously enough it is after all rare to find this complaint constant in true organic gastroenteric disease; in most instances some other pathological lesion is back of it. It is present to a greater degree in functional disorders, but even in these cases it is present only for a day or two and is then absent for a long time.

My attention was first directed to this matter about a year ago, while studying a group of patients who came complaining of various disorders of the gastroenteric tract, associated with high arterial tension and the complaint of bad taste. Since then, close questioning of all patients with high arterial tension and other evidences of nephritis has practically always revealed the presence of the symptom of persistent bad taste. In the last fifty cases there were but two or three which did not give a history of bad taste of long duration at some time during the preceding six months of the disease. Most of these patients do not complain of this symptom, but gradually come to regard it as an evidence of an upset stomach and neglect to mention it, or, because of its gradual appearance, they do not refer it to the present illness and pass it over as a minor matter.

In the early stages of chronic interstitial nephritis the patient complains of the bad taste only on arising in the morning and says that it disappears after breakfast. In this way it closely resembles and keeps pace with the suboccipital headache so characteristic of early nephritis. As the disease advances, often, but not always, it reappears later in the day, in some cases, particularly of the cardio-renal type, it reappears after exercise or at the close of the day. In one case, the ingestion of a meat meal caused a taste described as rubberlike to appear regularly two hours after eating and to persist for about two hours. In general, the prognosis seems to be worse the more constantly the taste is present; certainly in the cases observed by me, when it was constantly present and did not react to treatment, it was soon associated with other symptoms that caused one to give a gloomy prognosis.

In many instances bad taste was the only symptom the patient complained of, and I suggest as a working rule that when any one, particularly a person of forty-five years or upwards, comes complaining of persistent bad taste, a blood pressure examination be made at once. This sign often precedes the appearance of other symptoms by a month or more.

In the management of the high arterial tension cases, three lines of treatment succeeded fairly well; in cases associated with flatulence, the bromides, twenty grain doses three times a day, act better than anything

else. In cases without flatulence, digitalis, either alone or with hydrochloric acid, after meals, produced the best results, although by no means uniformly. The vasodilators, such as the nitrites, did not cause any improvement. In a few cases diuretics answered well.

Next in frequency I have found this complaint associated with gallstones and cholecystitis. During an attack of cholelithiasis a large number of patients complain of bad taste, which is generally ascribed to coincident gastric disturbance or to the morphine given to relieve pain. In most instances the taste is described as bitter, like gall. During the diminution of the attack, i. e., after the colic has subsided while yet the pain and soreness remain, the taste is sometimes described as dry, but quite often the "gall" taste remains. In a few cases, the taste was described as being like musty eggs. Medical treatment has not yielded any satisfactory results in this class of cases.

Bad taste is not necessarily associated with jaundice, inasmuch as the taste must be due to other toxic substances, as bilirubin does not appear in the saliva in jaundice. I believe that when the sign is present, it is of valuable diagnostic aid in differentiating gallbladder disease from other abdominal affections. It was present, in some degree at some time, during the course of seventy per cent. of the cases of cholecystitis and cholelithiasis observed by me within the past year. In some cases it was present in the interval after the attack and was the only symptom complained of. In a few cases of cirrhosis of the liver bad taste was complained of, but it was described as being like the taste of a tallow candle. This gall taste is practically always present in cases of drainage operation of the gall-bladder and persists as long as the bile drains off. In two cases where cholecystectomy was done, it was not present after the operation. In three cases of catarrhal jaundice the gall taste was present three or four days before the jaundice was noticeable, in one instance, a week before. At first sight one would be apt to think that the taste was due to the attack of gastroduodenitis that so often precedes catarrhal jaundice, but the taste persisted for several days after recovery, appearing only in the morning on awakening, and it was distinctly different from the ordinary bad taste of digestive disorders.

There are many other diseased conditions associated with bad taste, of longer or shorter duration, but as far as I have been able to ascertain, the presence of this symptom does not materially aid us in diagnosis, except in the two diseases above mentioned. Of such conditions diseases of the digestive tract easily rank first in frequency. Contrary to the experience of other observers, patients presenting evidences of intestinal toxemia without other disease, have not commonly complained to me of persistent bad taste. While it is true that at times almost all such patients do complain of taste troubles, it is rarely present persist-

ently. Of two dozen such patients seen recently, only three complained of this symptom; in these cases the patients complain of flat, pappy, or "dark brown" taste.

The ordinary bad taste occurring in acute digestive disorders, is generally described by the patient as a flat taste. Sour or bitter tastes are rather rare; they are temporarily present and are not of any importance. In the treatment, the use of calomel, followed by a simple rhubarb and soda mixture, is all that is necessary. Occasionally there are cases that do better with hydrochloric acid.

In some cases of pulmonary tuberculosis a bad taste comes on about noon and lasts until bedtime. The patient sometimes tastes his food as it should be, and experiences bad taste only with the mouth empty. In other instances the food tastes flat. Occasionally antipyretics of the coaltar series modify it, but rarely is this so.

The bitter taste sometimes associated with coryza is occasionally relieved by epinephrin spray. More often there is a complaint of no taste or that everything tastes the same. This is only temporary.

Kleiner has described a disordered taste present in acute rheumatic fever. He thinks salicylates relieve it. I have observed this symptom frequently and believe it is present in about sixty per cent. of the cases. Some complain that it is a bitter taste: others say that it tastes acid. One must not confound it with the taste sometimes following the administration of antirheumatic remedies; it disappears before the joint symptoms do. In passing, it may be mentioned that the administration of certain drugs, particularly iodides, is followed by unpleasant taste. Here, of course, its persistence depends on the continuation of the drug.

A sweet taste is said to be present in cases of inanition. In two cases of pernicious anemia, persistent bitter taste preceded the other clinical symptoms by six and eight months respectively.

Decompensating cardiacs often complain of bitter taste; it is associated with edema and other evidences of passive congestion of the kidneys, and is probably analogous to the taste in nephritis mentioned above. Digitalis and diuretics usually lessen it. Patients with arteriosclerosis sometimes complain of an inversion taste, i. e., salty things taste sweet to them.

A metallic taste appeared in one case one hour after the beginning of the pain of renal colic; this was associated with dryness in the mouth. In another case, the taste appeared during the attack. The taste in diabetes is described as sweetish, but in my experience this is uncommon. Most of the diabetics had albumin in the urine in addition, and had really combined diseases; they complained of a bitter taste, which is present in a large proportion of all diabetics when the disease is progressing.

In hysteria and neurasthenia the taste most commonly complained

of is that of an intense acid, and this is a source of great irritation to the patient. Argument and reason cannot dissipate it, and curiously enough examination of the buccal secretions generally reveals a marked acid reaction. Occasionally there is an accompanying dryness of the mouth most noticeable at meal time or when talking. Bromides lessen, but do not relieve it. Prolonged rest has always cured it.

At the menopause many women complain of this symptom. It is usually more marked in the afternoon and generally does not interfere with the taste of food. Many women, before or during the menstrual molimen, complain of bad taste. It is often associated with bad breath, but it bears no relation to gastrointestinal disturbance. Nothing that I have been able to do has lessened the complaint at this time.

Many men complain of a bad taste the morning after excessive smoking. It is variously described, but a flat taste is the commonest complaint. Stopping the smoking gives relief, as might be expected.

In passing, it may be mentioned that a complete bilateral loss of taste is almost always due to hysteria. Occasionally, in the early months of pregnancy, a sour taste is present, usually most noticeable in the morning. Sometimes it is present shortly after eating and is not associated with other gastric disorders. Gastric and duodenal ulcer patients occasionally complain of continuous flannel-like or sweetish taste, but it is not characteristic. In cancer of the stomach, sometimes the patient complains of a pappy or an insipid taste. Two patients with cancer of the uterus complained of a slimy taste.

Pyorrhœa alveolaris is accompanied by bad taste, but here the relation is quite evident. In the course of nearly all acute febrile diseases bad taste is complained of, but it does not have the same persistence as in the cases mentioned above. In disease of the central nervous system anomalies of taste occasionally occur. These are generally due to syphilis. In one case the patient complained of complete absence of taste for six months. Two weeks of mixed treatment completely cured him.

A bad taste sometimes precedes epileptic and migraine attacks. Occasionally in accessory sinus disease there is a complaint of bad taste, yet in most cases I am inclined to think that it is due to disturbance of the olfactory portions of the taste apparatus. The location of much taste perception is in the superior pharynx and posterior nares. The irritating odors of pus from the sinus give the impression of bad taste.

Finally, as a result of a year's close questioning of patients on the subject, I am convinced that persistent bad taste in the mouth is a symptom of much importance; that it is always an expression of a serious toxemia, and is frequently of very great service in the early diagnosis of disease.

I wish to express my thanks to the attending staff of Harlem Hospital for the privilege of examining many of the cases mentioned above.

220 West 139th Street.

DISCUSSION.

Dr. Bishop said that the paper was particularly interesting on account of the way in which Dr. Reilly had got away from the stomach. The more experience we had, the more were we inclined to discard the gastric origin of these bad tastes in the mouth. Many of the cases he believed to be due to protein poisoning. Recent work at the Rockefeller Institute had shown that the amino-acids resulting from the breaking up of proteins were primarily stored in the tissues, while the old idea was that the wonderful transmutation of proteins took place in the intestinal walls. There had never been any proof, however, that such was the case. This new conception made it easy to explain why so many things happen, not immediately after a meal, but in the course of three or four hours. He had an idea that at the expiration of two or three hours after a protein meal there was a return of some of these amino-acids to the stomach. He knew, at least, that in arteriosclerosis these bad tastes were very common, especially after the patient had eaten eggs. Some patients would tell him that they had had coated tongues all their lives; but it was found that after eggs had been eliminated from their diet the condition disappeared.

Dr. Robert T. Morris, New York, said it was a question whether some of these abnormal tastes in the mouth were not due to irritation of the cerebral center of the gustatory nerve. This distinction he thought should be made in a good analytical investigation of the subject.

Dr. Noble P. Barnes, Washington, D. C., said that the writer had presented an old and common symptom in an interesting and impressive manner. This condition, as patients often expressed it, "bad taste in my mouth," was more ancient than the many substances used to overcome it, and exceedingly common, as was evidenced by the frequent exhibition of gum, tobacco and toothpick chewing and the use of various breath-killers. Physicians had only given passing consideration to this very important symptom, for abnormal or disagreeable taste was a symptom that served as a valuable diagnostic aid. Given the proper consideration, we might easily divide the etiological factors into three distinct classes: first, and most common, being the result of faulty metabolism, faulty elimination or protein poisoning; second, the result of local or general infection; and third, the result of certain chemical substances taken into the body. To attribute parageusia to a neurotic condition was only meeting the subject half-way, because there must be some cause for the said nervous disorder. It was, therefore, most important to make a thorough investigation to determine whether the sufferer had disturbances of metabolism or some other morbific condition which could be relieved by the removal of some error in his diet or habits. Often we would find the putrefactive bacteria, those little hasteners of old age, eliminating their toxins into the tissues; this, together with chronic obstipation and faulty elimination, had been the most frequent causes for this complaint in his experience. Of the various therapeutic measures suggested to meet any and all of these factors, one that had not been mentioned, and one that occurred to him to be of most importance, was simple H^2O—plenty of good pure water to help the general sewage system of the body.

Dr. Stewart said that the bad taste in some cases might possibly be due to peptone regurgitation. When proteins were acted upon by the gastric juice they were split up into peptones and amino-acids. Peptones were very bitter.

Dr. Reilly, in closing, said he believed that the bad tastes referred to by Dr.

Morris were due to elimination, because this explanation was in line with what was observed in other mucous membranes. In answer to a question by Dr. Cordinier, as to whether he had observed that the taste was more marked at the back of the tongue, he stated that he had not observed any special region more affected than the rest of the mouth. In many cases of the cardio-renal type it was found that up to three or four weeks before the occurrence of the first symptom the taste had been perfect, and that a bad taste in the mouth had then made its appearance. He was quite sure that everyone had had this complaint brought to his notice on many occasions. In two diseases, interstitial nephritis and gall-bladder disease, when the sign was present it sometimes gave us valuable information. As to other diseases, time would disclose whether it was of any value.

CARDIAC HEADACHE.

Description and Treatment.

BY LOUIS KOLIPINSKI, M.D.,

WASHINGTON, D. C.

When we record the anamnesis of a patient with chronic headache, we describe one of several types, distinct and vivid enough, but whose primary cause is often not perceived and not apparent to the sufferer even of a lifelong malady. Thus we observe some subjects who are seized with a headache in daily, weekly, or monthly paroxysms. The pain is in the forehead or occiput, a local spot or the whole cranium. It is dull and diffused or very acute. It may be boring, blinding, splitting, or bursting. There may be nausea and vomiting. No exciting cause may precede, or mental excitement, bodily exertion, or errors in diet are obvious. In some cases there is habitual or acute constipation. In each attack the room or bed is guarded. The ever recurring headache may last a lifetime. Beside subjects in seeming normal health who are its victims, in others will be found a nervous constitution, the neurasthenic and dyspeptic for example. In still others there is obstructive disease of the nose or refractive error of the eye.

This headache whose treatment is difficult and the result unrequiting to one's labor is the *habitual* or *nervous headache*. In a second class there is a pain in the head of a very severe degree. In typical instances it is always one sided. The scalp is hyperesthetic. There are acute nausea and persistent mucous, bilious, or acid vomiting. There is much muscular prostration. Before the pain in the head is felt, an aura, usually of vision, is perceived, scotoma, hemianopsia, flashes of light or colors, diminution of objects in size. The patient, prostrated in bed, is intolerant of motion, light, and sounds.

The headache beginning in childhood is commoner in females. In many cases there is direct parental transmission, oftener through the mother. Among exciting causes may be found fatigue of brain or body; anger, apprehension, and grief; fasting or foods which are for the subject indigestible. Its essential cause is undiscovered. An autointoxication is held by many to be a primary agent. Others hold it to be a cerebral congestion from temporary closure of the foramen of Monro; others again that there is a hereditary disproportion between capacity of the skull and volume of the brain. There are those who believe that in this

headache there is a vasomotor disturbance of the sympathetic nerve of a spastic form (Du Bois Reymond) or of a paralytic stage (Moellendorf). Thus from spasm the skin of the face is cool and pale. The arteries of the head are contracted, as seen in the temporal. The pupils are dilated and the salivary secretion is lessened. From paralysis the face is hot and red, the pupil contracted, the arteries are pulsating strongly, the skin on the painful side is perspiring. This headache lasts from half a day to two weeks, and occurs about once a month, in females at the time of the menstrual flow.

First described by Aretæus in the second century, it is hemicrania, migraine, or sick headache. Obscure in origin like the first, it persists a lifetime, from childhood to old age, and baffles or defies the ordinary treatments of the past or present. Flatau, in his monograph *Die Migraine*, describes this chronic headache in six forms: Common migraine, ophthalmic, epileptic, psychic, ophthalmoplegic and prosopoplegic. Its pathogenesis is considered theoretically by him as reflex, sympathetic (vasomotor), central or cerebral, and toxic or toxemic. He thus concludes his work: "From all of these reasons we may believe that migraine is neither clinically nor pathologically an autonomic disease, but only a syndrome which may be held to be a form of expression of a congenital predisposition to pathological neurometabolic processes that is a congenital neurotoxic diathesis. The ductless glands play perhaps an important role."

The migraine paroxysm depends on pathological brain mechanism not localized or confined to one pathological process. Moreover, it must be assumed on the one hand to be multilocular, that is, affecting different brain areas; on the other hand, passing through different morbid processes, especially that of increased pressure of the cerebrospinal fluid like that in Quincke's angioneurotic hydrocephalus. Further, migraine must be considered a disease in which, from analogy of predisposition, other similar diseases and morbid processes may appear in other brain areas and parts of the body leading to other special neurometabolic syndromes. Thus the kaleidoscopic picture of migraine, the polymorphism of the accompanying and interparoxysmal symptoms, and finally the conjunction of migraine with other diseases become clearer. Flatau's treatment of migraine concludes: "To future therapy is reserved the discovery of the true basis of the disposition to migraine and the deeper knowledge of the pathological processes."

Habitual headache may be held to be distinct from migraine in that the second is one sided, with vomiting of bitter or acid fluid with preliminary visual disturbance. Migraine is of marked hereditary transmission and more common in women and children. Hemicrania or migraine is the most frequent of all the chronic headaches; moreover, by rigid adherence to the differential symptoms, migraine becomes

more common, habitual headache less and less. Of other chronic headaches the neurasthenic may be a third variety unless classed with the habitual. In it there is no acute pain in the head, but a feeling of oppression and constriction. There is no gastric disturbance. It is an integral part of cerebral neurasthenia.

Another protracted headache is that which has been called the nodular, rheumatic, or induration headache.[1] The majority of such headaches are in middle aged females with no hereditary predisposition. Freedom from pain is rare, and intervals of ease are not felt. The pain is in the whole head, beginning in the occiput and radiating to the shoulders. The suffering is worse at night, and in changeable weather, like neuralgic or rheumatic pain. There is no impairment of the vision, no vomiting. The internal organs are healthy. What marks this headache as unique is the finding by palpation of certain very tender nodules of infiltration (myositis), from the size of a millet seed to that of a bean, in the subcutaneous tissue and fascia of the occiput, the neck to the shoulders, and the upper part of the back. These nodes are less common in the frontal and temporal regions. Furthermore, infiltrations like callosities are found in the course of the superior nuchal line of the occipital bone and in the mastoid process where the occipitofrontalis and larger cervical muscles are inserted. Both sides are equally involved. The infiltrations attain the size of a hazel nut or almond and are very tender. The muscles affected are the trapezius, sternocleidomastoid, splenius, scalenus posticus, occipitofrontalis, and temporal.

Those who identify the nodular headache as special, differentiate it from migraine and the other varieties of this chronic malady, in that it is not inherited, not found in childhood, the pain is pre-eminently occipital and continuous, always bilateral, never with aura or gastric irritation; finally, by the detection of the nodules in the scalp and local muscles, and the curing of the headache by massage.

The last chronic headache to consider is that from eyestrain. It may arise from over use of the normal eye or from exhaustion of the internal recti and of the muscles of accommodation. The pain of the eye and forehead may become diffused over the head. The muscle spasm of over use may engender the luminous scotoma and disturbed vision of migraine. Hyperopia, presbyopia, astigmatism, and anisometropia are also causes of headache from direct ocular defects.

By far the most frequent and best known of the chronic headaches is migraine. The habitual comes next, but where neurasthenia and hysteria are recognized, it is but rarely seen. The nodular or rheumatic is very rare, with its entity not so clearly fixed as to convince the

[1] Siegmund Auerbach, *Headache*, translated from the German by Ernest Playfair, London, 1913.

doubter of its reality, the more so where massage as a cure is not too highly prized. Since migraine may appear in incomplete form, the visual aura absent in one case, vomiting in another, since in migraine the pain may be in the occiput and not at all in the forehead, since finally in this same migraine the scalp is tender and sometimes painful nodules can be felt in the scalp and neck, strong doubts arise as to the absolute distinctness of the habitual and rheumatic forms. The headache of eye-strain is likewise rare because the use of glasses for visual defects is so general that unrecognized instances are rarely found except in the very young. It will moreover be observed that the subjects of chronic headache are provided early in their affliction with lenses for correcting errors of refraction.

The different features of the varieties of chronic headache, the obscurity of their origin, their vague and different causes, their obstinacy in recurring, their perennial duration, their baffling and discouraging treatments, all combine to make them a field for further labor. For even migraine, than which no malady is more sudden and acute barring its next of kin, an epileptic convulsion, has no fixed or determined history, and observation must make it plain that this headache is not a particular disease but can be artificially produced by the toxic actions of several drugs, e. g., tobaco and digitalis. The toxic actions of these poisons may be acute or chronic and from the chronic detrimental effects of tobacco are found headaches, habitual or nervous and migrainous, and neuralgias of both face and head. With tobacco headache there is always a tobacco heart, a mild myocardial depression or degeneration, which evinces itself later on with the other heart symptoms of nicotine poisoning. That the vertigo, headache, scotoma, disturbed vision, nausea, and vomiting of digitalis poisoning, as well as the slowed, rapid, or irregular pulse, are all secondary to its action on the heart, stands beyond question.

When we make a careful and deliberate physical examination of the chest of a subject of chronic headache we find the sounds of heart weakness. As a strong or normal heart is here never found, this statement is without exception. The heart is weak from birth or weakened by antecedent disease. The heart may be congenitally small, may be enfeebled by strain or labor, may be lessened in tone and vigor by disease or degeneration. There may be perceived organic valve defects, anemic murmurs, irregular, too rapid, or intermittent heart contractions, faint or absent sounds or apex impulse. In short, chronic headache means myocardial disease, weakness, or poisoning which has not advanced to inadequate compensation, to cardiac insufficiency, to the asystolic stage. Chronic headache is the most marked and persistent of the symptoms of weakness of the left ventricle of the heart, and the causes of this failing cardiac adequacy are the ultimate causes of chronic

headache. A weakened heart before much dilatation causes headache, neuralgia of the face and head, nervous dyspepsia, vertigo, mild dyspnea on walking up hill, general exhaustion, muscular fatigue, muscular rheumatic pains, and eyestrain.

In bronchial asthma there is mild dilatation of the ventricles, more of the right one with mild and transient emphysema. Conversely, the ventricles, slightly dilated, produce a cardiac asthma difficult to distinguish from the spasmodic. In lesser degrees of severity and duration, and of greater clinical importance, these weak ventricles result in a bronchitis, not chronic but of lengthened duration. Finally, from heart weakness result hemorrhoidal disease, eczema of the lower limbs, varicose ulcer of the same, local cutaneous edemas, and chronic urticaria.

In the grave stage of heart disease headache is not felt; in the obscure early stage it is both important and significant. From this it appears that habitual or nervous headache, neurasthenic, hysterical, nodular or rheumatic, hemicrania or migraine, and the headache from over use of the eyes or from visual defects, are in most instances, practically in all instances, caused by a weak heart. The view offered by this pathology discloses a number of facts pertaining to headache otherwise of obscure origin, as it makes the generic term cardiac headache correct and appropriate. The main facts and reflections hence are these:

The lifelong duration of chronic headache depends on the lifelong weakness of the heart. We read of chronic headache with the dissatisfying treatments and gloomy prognosis, where nothing will help, but the victim finds spontaneous relief or cure with beginning old age. This is a statement of a sardonic kind. For many malcephalics do not reach that time for various reasons, and those who escape the natural period of chronic headache enter the narrow domain of cardiac incompetency or sudden death.

Cardiac headache is a headache with fatigue as its chief exciting cause; the weak heart and weak muscular system when exercised tire out. There are feelings of lassitude, weariness, and exhaustion. Often the muscles ache with dull or acute rheumatoid pains. The subject retires to rest and awakens in the morning or shortly after midnight with an attack of headache, occipital, nervous, nodular, or a migraine with one, two, or three phases of a paroxysm, disturbed vision, headache, vomiting.

If headache is held to be an irritation of the fifth cranial nerve and branches, is cardiac headache due to anemia or hyperemia? It is a medical fact that nicotine, a heart sedative and depressant, can produce a similar paroxysm. It is also well known that anemia of the fifth nerve is the most frequent cause of facial neuralgia. Now headache and this neuralgia from the same or a similar cause are sometimes found alternating or succeeding in the one case, and are curable by identical treat-

ment. Therefore cardiac headache is due to an anemia of the brain or cranial nerve.

Since fatigue or muscle tire is the great exciting cause, there follows a variety of intrinsic acts and motions that bring on headache by enfeebling the languide heart muscle, the abuse of tobacco, of alcohol, of anilin derivatives in "headache powders," or close rooms and summer heat, long walks, dancing, late hours, prolonged exercise, work, sleeplessness, anxiety, grief, anger, loud speaking, shock, alarming news, fasting, the eating of food indigestible to the patient, constipation; in fine, all the voluntary and involuntary acts of life requiring muscle and heart effort.

Eye fatigue in a normal eye from over use or eyestrain, from effort at accommodation, from refraction defects, must often be considered analogous to general muscular fatigue, and it can be observed that almost every patient with chronic headache wears glasses.

Chronic headache as illustrated in migraine is hereditary, as is the weak heart. It is much more frequent in females, who are naturally less robust than males, the heart and whole muscular system less strong and resisting than in the other sex. The exciting causes are obviously the many acts and states, mental and physical, which comprise life, its diseases and intoxications. The female is prone to headache at the menstrual period, an exhausting phenomenon. Sexual congress may likewise produce it in either sex. The woman in pregnancy with normal heart hypertrophy becomes for the time immune.

Migraine begins after midnight or in the morning on awakening from sleep, after the exciting cause of depression has acted sufficiently long the day before. The nausea and vomiting of migraine and the overacute state of smell, sight, hearing, and taste are obviously due to cerebral irritation or exhaustion. The patient feels it necessary to lie quietly in a dark and silent room. Cardiac headache may be accompanied or replaced by the tic douloureux and introduced or followed by severe vertigo. In these cases the heart lesions are always manifest and heart insufficiency comes on later.

As further symptoms directly caused by altered cerebral vascular circulation in cardiac headache, we can identify these accessory manifestations in old and complete migraines: Amblyopia and scotoma, transitory tingling and numbness in face and hand, transient monoplegia and facial paralysis, tics and aphasias, Jacksonian epilepsy, and epileptiform convulsion and unconsciousness.

Migraine,[2] followed by epilepsy, has been much discussed and disputed. Many observers admit the fact, but do not explain the mystery.

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[2] Möbius, P. J., *Die Migraine*. Féré, *Belgique médicale*, xiii, 1906. Cornu, Contribution a l'étude de la migraine, *Thèse de Lyon*, 1902.

Migraine, as chronic headache, may be followed by the epileptiform convulsions of elderly or aged persons, but not preceded or associated with true idiopathic epilepsy. The epileptiform convulsions are obviously due to a graver heart lesion, as are other associated and subsequent manifestations of the same defect; asthma cardiacum, angina pectoris of dilatation or sclerosis, retinal hemorrhage or thrombus, and finally apoplexy, that is, cerebral cardiac embolus with convulsions, transitory monoplegia or paraplegia, Jacksonian epilepsy, aphasias, and ataxias.

From this description of chronic or cardiac headache it is plain that the treatment must be recast. Some things may be relegated to disuse, others avoided as dangerous. The prime indication in the treatment of a headache or its analogue, a facial neuralgia, from a weak or weakened heart, is to strengthen, support, or, if possible, to restore it to normal. This can alone be done where the many acts in life which overtax this heart and weaken it still more, are persistently and intelligently avoided. Where eyestrain is found glasses must be used. If obesity is present the weight must be brought to normal. If tobacco is used it must be given up. This applies in every case of cigarette smoking and to this petty and enfeebling vice when practised by females. The weakened heart of chronic nicotine poisoning is a counterpart or double of organic myocardial weakness, and it is impossible to separate or distinguish one morbid state from the other until the tobacco poisoning is eliminated.

Rest of the body must be practised as a daily system. One who works must retire at nine or ten o'clock and arise at seven. For one incapable of work or who lives retired, the afternoon rest must never be omitted. The afternoon rest in heart weakness is taken from two or three to five p.m. A bed or couch must be occupied, a reading table may be at hand. If the brain is active or vigorous, the time is spent in reading, study, or writing. If muscle fatigue is present, the patient may doze or sleep. Afternoon sleep indicates accurately and absolutely a marked degree of exhaustion. Sleep or drowsiness in the afternoon does not occur when the subject possesses more muscle tone and strength, i. e., a stronger heart. Where the afternoon rest is not taken, where the patient is engaged in business or work, the daily hours of lying down should still be as long as possible. Twelve continuous hours of rest are not as helpful as the same number of hours of the afternoon and night. The afternoon rest, which is an adaptation of the tropical siesta, a physiological habit, is of great benefit in the treatment of all heart diseases not in an acute or grave condition.

Medicinal treatment is essential to cure a chronic headache. There are two remedies of similar action which will accomplish this. Digitalis is the first. It should be given in a single dose, repeated in one or two days, and continued for months and years. The powder of the leaf, its tincture, fluidextract, or infusion may be prescribed. Far better than

these is digitalic acid, the acid resin of digitalis described by the writer. A single daily dose of one thirty-second or one sixteenth grain of it or of its sodium salt may be given for an indefinite time.

Rest and digitalis cure cardiac headache. Even improvement or occasional cure results, but the obstinacy of this afflicting malady is so inveterate that the patient does not receive fair and full attention where they are not combined. Now and again digitalis fails or must be given with sodium iodide to regulate the pulmonic circulation. Where digitalis does not help, the substitute for the time is strophanthus; with arterial sclerosis, aortic valve defects, pulmonary engorgements, strophanthus and sodium iodide. Strophanthus in a few instances replaces digitalis. Sometimes digitalis must be suspended and strophanthus given instead until the heart again becomes susceptible to digitalis. Strophanthus acts best with laxative or purgative drugs. In fact, the strophanthus action, with free movements of the bowels and vomiting, is no disadvantage when it is given for cardiac asthma, lung edema, or similar states of other viscera. The treatment of a paroxysm of cardiac headache becomes an ignoble task where massage is practiced, where chloroform or morphine is given, or the anilin compounds under commercial names. In fact, the headache powders of the coaltar derivatives are without much doubt or question dangerous and deadly.

The special treatment of an attack of cardiac headache is of secondary importance, as such attacks cease altogether or become mild and endurble under the treatment described. However, an efficient remedy for a severe paroxysm will be found in two grains of caffeine citrate in a teaspoonful of aromatic elixir every fifteen or thirty minutes until relief is felt.

Since every town or neighborhood has its chronic headache or migraine in woman, child or man, since it crops up for the asking in every medical practice, on all sides can subjects of this complaint be found for analysis and study. No loss of time or opportunity is ever felt in observing a malady, chronic, persistent, and the most frequent of all the minor states of ill health. From this universal supply are selected varied and typical cases to illustrate the foregoing essay. These patients were either cured or relieved by the treatment described.

An arrangement of these twenty-four cases of chronic headache discloses the following interesting facts: Twenty were in females, four in males. The average female age at the time of treatment was forty years, the average male age fifty-one. The youngest patient was nine, the oldest seventy years old. Of adult females, five were single, ten married. Of the ten married, two were barren; of the fruitful ones came thirty-eight children. It will be plain that each case has a heart lesion evident enough on examination and that in the older subjects where the headache era disappears, other evidences of heart defects succeed.

Case I. A girl, aged nine years, child of patient XI, had had pertussis, measles, and articular rheumatism, the last a frank febrile infection of a month or more. Migraine for two years, frontal headache, sometimes vomiting, and saw red and green zigzag lines and sparks, with eyelids opened or closed. Pulse 120, rapid heart of adolescence; probably benign endocarditis without audible injury of the cardiac valves.

Case II. Maiden, aged fifteen years, 5 feet 2½ inches tall, weight 98 pounds. First menstruation at twelve years. Daily frontal morning headache for two years, vision and function of stomach normal. With the headache came a feeling of general muscular weakness, impelling her to lie down. Typhoid fever eight years ago. The mother in her girlhood had the same headache with muscular exhaustion. Heart sounds regular but faint, valves intact, a pure weak heart. This case was cured with afternoon rest and a single dose of digitalate of sodium, grain 1/25 every second day.

Case III. Maiden, aged fifteen years, 5 feet 7 1-3 inches tall, 135 pounds. Mother had migraine with a chronic myocarditis; older and younger sisters immune. Menstruation at thirteen years, painless, did not want to go to school and tried work as a shop girl. After a month too tired to continue. Five months later a second attempt at employment lasted two weeks. Had a continued tired feeling, more so each afternoon; on walking, dyspnea; dull frontal headache for about a year without nausea, vomiting, or disturbance of vision; scalp and neck not abnormally sensitive. Lying down relieved the headache. Vision normal. Pulse sitting 96; *bruit de galop* aortic and mitral stenotic murmurs.

Case IV. Girl, aged seventeen years, 5 feet 4 inches, 122 pounds. Two brothers, sister, father, mother, free of headache. Menstruation since fourteen years every second month, lasting four to five days, painless. Migraine every two or three months, not menstrual. Pain in right temple, acid vomit. Before headache hemianopsia. Astigmatic, wore glasses which were useless for the headache. Felt tired every afternoon for the past three or four years. Rapid walk caused dyspnea. Chlorotic color; cold hands; suprasternal pulse visible; heart sounds faint and muffled, no valvular murmur. *Bruit de galop.*

Case V. Single woman, aged twenty-one years, 5 feet 6 inches, 110 pounds. Headache for ten years, formerly daily, now once or twice a week. Duration twenty-four hours, bitter vomit, no scotoma. Sometimes at monthly period pain in temples, vertex, and occiput. Nodules or small masses over submaxillary glands indicated a severe headache. Formerly wore glasses, now discarded. One of her four brothers had this form of headache. Her mother was free, her grandmother and aunt, her mother's sister had migraine, also her father's sister. Pulse regular, 72, heart action, *bruit de galop;* impulse and sounds feeble.

Case VI. Woman, aged twenty-eight years, 5 feet 6 inches. Weight in winter clothing, 117 pounds. Muscles developed by work; married nine years. No conception or child. Menstruation five to seven days with migraine of one and one-half day at that time. Pain over right and left brows, sight became blurred, no vomiting. Had been wearing glasses for the headache for three years. Suffered also with headache at intermenstrual time and this from early childhood. This headache she observed followed any trip from home, visiting, and shopping. With these spells the eyeballs ached and the neck muscles became stiff, the scalp tender. Is fond of housework, washing, and ironing; from 6.20 a. m. to 10 p. m. Exercise, no dyspnea, but aching and dropping of the limbs to the eyes, *i. e.*, acute muscle fatigue. Pulse, sitting, 60; heart area increased dullness; valves faint and gulping sounds, *bruit de galop.*

Case VII. Married woman, aged thirty-two years, medium height; weight 139 pounds, five children, general health fair. Had four sisters, three of the five had chronic headache. Mother and father free. A brother had headache from constipa-

tion. Married at twenty years; headache occasionally before this; had them once a month to twice a week. Exciting causes overeating, worry, and excitement. Pain, frontal, right brow, later occiput; lasted three days, at times bitter vomit and disturbed vision; not helped by glasses. Pulse, sitting, 84, very faint; heart sounds not clear, *bruit de galop*.

Case VIII. Single woman, aged thirty-five years, 4 feet 1 inch, 126 pounds; former weight 112. Her mother died fifteen years ago; eight years later, her father. She the eldest of twelve. After her mother's death, brought up the children, and with the help of a single servant, did all the housework. Continuous daily headache for fifteen years. Myopic and wore glasses. Always fatigued. Headache began 6 a. m., often continued until she went to bed at night. Pain frontal and occipital. Headache made worse by depressing head, menstruation made headache worse, scalp not tender. No ocular aura and no nausea or vomiting. Dyspneic on walking; funnel breast, *bruit de galop*, heart sounds very faint, skeleton rhachitic.

Case IX. Woman, aged forty years, single, 5 feet 5 inches tall, weight 124 pounds. Father's health normal, mother's side tuberculous. Mother's sister had migraine. Mother had weakened heart for thirty-five years, well compensated, probably fatty. Patient had little endurance and some years ago a chronic bronchitis probably tuberculous. Menstruation began at seventeen years, the chronic headache at fourteen. At this time struck her left temple in a severe fall from a stone doorstep. She always thought the injury had caused the headache because of the tenderness of that part of the scalp in an attack. The sensitive area was two square inches, an inch above the left ear. Her eyes were always much inflamed (scrofulous blepharitis) in a headache and she could not lie down as the pain was aggravated by throwing back the head. For years she did not dress until she had put on glasses, as going without them, even for a short time, would cause a headache. When this had existed forty-eight hours nausea and vomiting followed. The eyes felt strained, stiff, and cold. The headache awoke her in the morning; usual site, left temple and behind left ear. She could not stand either noise or light and dreaded each return. From the twenty-second to twenty-fifth year, never without headache. At that time tried to avoid attacks by very secluded life, without success. Later she perceived that fatigue and becoming tired always caused the attacks. For the last six months headache absent since treatment began, and she found her glasses less and less necessary. Heart area small on percussion, heart sounds faint, impulse weak, *bruit de galop*.

Case X. Woman, aged forty-one years, 5 feet 4½ inches tall, weight 135 pounds; one child, thirteen years. Migraine chiefly menstrual. Nausea, insipid vomit, pain right brow. Aura absent; duration three days. Began with her first menstrual flow at seventeen years. Onset at 2 a. m. Causes to her unknown. During her pregnancy had a continuous occipital headache, but no tenderness of the scalp. The heart sounds were faint; aortic stenotic murmur; pulse, sitting, 84; blood pressure 110; no dyspnea. Household work of the family from 6 a. m. to 6 p. m., retires 10 p. m. Headache powders no longer relieved.

Case XI. Woman, aged forty-two years, medium height, regular menstruation, two daughters, older nine years, weight formerly 205 pounds; after treatment 180. Migraine at thirteen years with vomiting of bile; after twentieth year scotoma appeared. Two or three attacks a month, pain on vertex, trapezius, sternocleidomastoid, great pectoral. Muscles exquisitely tender on pressure. Headache also menstrual. Exciting causes, worry, hurry, and summer heat. Heart hypertrophy and dilatation, angina of chest and left elbow on walking, also moderate dyspnea. Heart sounds faint, diffused, and irregular, valves intact. A sister, slender, weight 125 pounds; severe migraine from fifteen years with vomiting. Wore glasses from girlhood to her death at forty-five years of consumption.

Case XII. Married woman, aged forty-four years, height 5 feet 2 inches, maximum weight 96 pounds. Menopause ten months. Consumptive family history. She had four children. Headache since fifteenth year; two forms: One pain in vertex, seven or eight attacks a month; the other, developed migraine, frontal headache, and much bilious vomiting four or five times a month. Pregnancies aggravated the headache. For three years glasses for hypertropia, without effect on headaches, which were more severe in summer. Did all the household work alone, also took care of her children. Lungs normal; heart enlarged; mitral and tricuspid systolic apex murmurs, *bruit de galop*. Did not submit to treatment. Strophanthus taken at the time mitigated the paroxysms.

Case XIII. Married man, aged forty-five years, 5 feet 10½ inches. Maximum weight 176 pounds, at twenty-two years weight 114 pounds; occupation printer. Chronic headache began at twenty years, rarely without it. Gave up tobacco at twenty-six years, as its use made headache worse. Onset at 12 midnight or 1 a. m., sometimes in the afternoon. No vomiting. Headache in right temple and at times with neuralgia right second branch of fifth cranial nerve, but not this neuralgia alone. Ancestry tuberculous, also brother and sister. Had dyspnea from exertion and fainting spells from hot weather. Heart enlarged; idiopathic hypertrophy.

Case XIV. Woman, aged forty-five years, 5 feet 7 inches. Maximum weight 192 pounds at forty-two years, married, never pregnant, small submucous uterine fibroid tumor. Mother no headache; mother's sister, migraine many years. As a child of ten years frequent severe headaches, no vomiting. Supposed to be due to overstudy. Menstruation with thirteenth year. Complete migraine spells since her fourteenth year, scotoma, and vomit. Since her twenty-fifth year, right trigeminous neuralgia, second and third branches. Heart, idiopathic hypertrophy and dilatation, heart sounds faint. Under treatment the tic douloureux was cured (*digitalic acid*). The migraine attacks returned, resulting from overwork in housekeeping.

Case XV. Woman, aged forty-eight years, medium height, maximum weight 175 pounds. Menopause fourteen months. Two children. Phosphaturia. For ten years weekly attacks of migraine, also with menstruation. Vision so enfeebled in beginning of the attacks that sometimes she feared blindness. The headache was also caused by worry and excitement. Began in the morning with occipital and frontal pain and tenderness of the scalp. No vomiting. Was able to eat with a headache, and remaining in bed aggravated it. Muscles of the neck and occiput were persistently so tender that she shrank from the touch, and the skin of the neck and shoulders had painful nodules on manipulation, which further caused a diffused erythema. Dyspnea on mounting stairs. Pulse 136 when sitting. Heart dilated, *bruit de galop;* aortic stenosis murmurs, mitral and tricuspid valve sounds accentuated.

Case XVI. Married man, aged fifty years, 6 feet 1½ inch. At forty-eight years, weighed 218 pounds, present weight 180. Mother, brother and sister all migraine subjects. He had had heat exhaustion, faintness, and much muscular lassitude. Headache began with fifth year, no vomiting. From sixth to fourteenth year daily morning headache on school days. At twenty, headache with acid vomit; from twenty-seven to thirty-seven as a grocer, erect and working many hours a day, his headache then occurred every Sunday morning, pain frontal with nausea and vomiting; was at the time able to eat. As a man, headache so severe as sometimes to cause unconsciousness. Wore glasses for far and near vision for ten years. Heart, congenitally weak; pulse weak, diffused; heart sounds faint. Was a cigar smoker, abandoning the habit for a time, improved in strength and endurance.

Case XVII. Woman, aged fifty-three years, 5 feet 6 inches, menopause at forty-eight. Maximum weight 175 pounds. Had five children. Headache began with fifteenth year. Whole head painful, acid vomit, no eye disturbance. Had worn glasses

habitually for twenty-five years. Onset of headache in the afternoon and about twice a month. With the menopause became less frequent. Two years ago (petit mal) night and day; aura ascending from feet or sensation of fainting, attacks varied in frequency. Headache no longer felt . Had dyspnea in walking. Sitting, pulse 96; heart sounds faint and weak; moderate cardiac hypertrophy and dilatation.

Case XVIII. Married man, aged fifty-five years, 5 feet 8½inches, weight 160 pounds. Clerk, as a young man, joiner for five years. Three children, his father nine children, one other of these always with chronic headache. His father, migrainous, died at eighty; his mother, exempt. Headache since his sixth or seventh year As a child attacks with bitter vomit every two or three weeks. After seventeenth year, no vomiting. At twenty attacks once a month. From thirty to thirty-five rare, after thirty-five monthly, but no vomiting. At present two days' duration; first one temple with pain, the next day the other affected. No neuralgia of face or head, no vomiting, no scotoma, but this last ocular disturbance as a child. With the headache he must lie abed, and it forced him to give up the use of tobacco; it also drove him to wish for death and contemplate suicide. Had nervous dyspepsia, chronic constipation, fell asleep in daytime readily; like his father, glasses for myopia all his life. Heart sounds faint, impulse feeble, pulse very weak, cold extremities, mitral and tricuspid murmurs. Blood pressure 110.

Case XIX. Married woman, aged fifty-five years, 5 feet 7 inches. Menopause at forty-six; maximum weight 145 pounds. Myopic, wore glasses since her fifteenth year. Mother died of carcinoma, father of diabetes mellitus. She had four children, three of whom were boys, all myopic; one of these died of diabetes mellitus at fourteen. Her mother and mother's sister had migraine, she herself also since her thirteenth year. Headache frontal, vomit sour, attacks two or three a month, one of which was menstrual. For the last ten years, headache of occiput or vertex, scalp hyperesthetic; vomited but rarely. Attacks still about two a month, but confined to bed three or four days with much muscle fatigue and long sleep of exhaustion. Causes as held by her, overexcitement, fatigue, indigestible food. Heart action rapid, impulse weak, heart sounds faint; an hereditary weak heart.

Case XX. Unmarried man, aged fifty-five years, 5 feet 8½ inches, weight 145 pounds. Two sisters and father not affected. Mother, lifelong bilious headache (migraine). With his tenth year frontal headache began with bilious vomiting, in bed half a day. No visual disturbance. Purgative gave relief. Attacks monthly or less often; ceased at thirty-five. For twenty years since attacks of neuralgia daily or three or four a week. Sites of the pain, eye, vertex and occiput. Had had a gleet for fourteen years and attacks of gonorrheal muscular rheumatism. Supposed tobacco heart. Heart, mitral regurgitation and stenosis, left ventricle, hypertrophy and dilatation; these lesions probably since his childhood.

Case XXI. Single woman, aged sixty years, medium height and weight. For thirty years severe migraine with bilious vomiting; from one to four attacks a month. Attacks treated with morphine injections at forty-five, menopause; at forty-five began to wear glasses constantly. Migraine ceased at fifty. At fifty-four cardiac cerebral embolus with aphasia and right hemiplegia; recovery slow and only partial; mental impairment; incessant complaints and fretting, self-reproach of the cause of ill health from masturbation in former years. Polyuria and phosphaturia, heart, aortic and mitral stenosis; heart action irregular.

Case XXII. Unmarried woman, aged sixty-five years, medium height, cook and domestic servant, formerly strong and active. With twelfth year, migraine, pain at vertex, scalp tender. Attacks began at four or five in the morning with persistent bilious vomiting, ocular aura not remembered; could not leave her bed for a day. Exciting causes, menstruation, anger, long hours, and overwork. After change of

life headache abated. At sixty-two right cerebral embolus, severe effect on constitution, little or none on the mind. Left side atactic. Of late headache had returned. Epileptic convulsions every few months and Jacksonian epilepsy left leg and arm. A chronic bronchitis preceded the brain infarction for a year. Heart, *bruit de galop*, aortic stenosis, tricuspid valve sounds accentuated. Dyspnea from any muscular effort.

Case XXIII. Married woman, aged sixty-nine years, medium height and figure, five children. At sixty-seven treated by me. Edema lower limbs, dyspnetic on walking, paroxyzmal tachycardia, aortic and mitral stenosis. Menstruation began at sixteen years. At seventen neuralgic headache with tenderness of scalp, neuralgia of upper jaw and teeth, three or four attacks each month, but without vomiting. From twenty-third year complete migraine attacks with bilious vomiting, kept her in bed once or twice a week. Menopause at forty-eight, migraine then ceased; glasses worn constantly since forty-fifth year. A migraine, the first attack in years, after reducing by taxis a strangulated inguinal hernia. With menopause, arthritis deformans, knees and fingers; after the change of life health improved. Her mother and her sister had migraine. Her son, thirty-two, single, severe migraine, wore glasses for astigmatism.

Case XXIV. Woman, aged seventy years, medium height, weight for years over 200 pounds. Ten children, all grown up. For ten years from her fifty-eighth, severe migraine, one to four spells a month, three to four days in bed. Attack began with numbness of the hands and blurred and indistinct vision. Pain over right parietal bone very severe, great nausea and bitter vomit. Causes apparent to the patient, worry and overloading stomach. Free from the attacks for eighteen months, accompanying treatment. Aortic and mitral stenosis, paralysis agitans marked in right, less so in left arm and hand, faint albuminuria persistent.

631 I Street, N. W.

DIGITALIS IN CHRONIC DISEASES OF THE HEART.

With Special Reference to the Advisability of Its Continuous Administration.

BY LOUIS FAUGERES BISHOP, A.M., M.D.,

NEW YORK, N. Y.,

Clinical Professor, Heart and Circulatory Diseases, Fordham University; Physician, Lincoln Hospital.

However much the scientific knowledge of digitalis may be advanced, the adaptation of the remedy to the individual must always remain a matter of art. Digitalis is like the foil in fencing or the club in golf. In the hands of one man victory is uniform, while in the hands of another defeat is equally certain; and yet the latter may know more of the theory of the game than the former. Skill results from the constant solution of similar problems. The time will never come when the profession will not benefit by the recurrence of hackneyed subjects. For this reason I make no apology for writing once more of digitalis, with a special view to its continuous use under certain conditions.

Fibrillation of the auricle, and very serious valvular disease, constitute the most frequent condition in persons who are benefited by the use of digitalis over periods of months and years without interruptions. In both conditions, when broken compensation has recurred on two or three occasions, and has been restored by digitalis after days of anxious waiting for the desired effect, a condition of well being, without these dangerous attacks, can often be maintained by suitably regulated doses taken continuously.

The matter of regulation in dose pertains to the art of medicine, and is not susceptible of absolute rule. When such a problem presents itself, it must first be decided whether this method shall be adopted as a policy. The amount of the drug required is more or less a matter of experiment. I have at the present time patients who take a grain and a half of digitalis every day; others who take three quarters of a grain on alternate days; and others a dose once a week. In each instance these doses were started after the phenomena of complete saturation was attained. In chronic fibrillation of the auricle, a good rule is to keep the pulse in the neighborhood of ninety. In chronic valvular disease, it is well to keep the tonicity of the heart muscle at such a point that there will be a minimum amount of shortness of breath.

The third type of disease where the continuous use of digitalis often is indicated, is the later stages, or, as I often call them, the "digitalis stage," of arteriosclerosis, when the high blood pressure has a tendency

to be succeeded by a lower pressure that falls beneath the line of compensation.

The use of so powerful an agent requires constant supervision, and a certain amount of option must be allowed to the one who is taking so potent a drug. Every heart patient should be seen at least once a month. With an intelligent person, that is enough for the efficient regulation of digitalis, even in serious conditions.

This method of using digitalis as a definite entity was introduced by Professor Groedel, in 1899. It seems to be a very simple system, but, as a matter of fact, I know few men who have really appreciated Groedel's idea. Only recently, after what I believed to be thorough instruction in the matter, I found a physician attempting to continue digitalis in the doses that were ordered in the face of urgent symptoms. The resulting nausea was frightful, but when the dose was reduced to a grain and a half a day, the patient was restored to comfort.

The important point is to anticipate the need of digitalis. Careful observation often reveals defective kidney action several days before other signs appear. Thus, it may be needed once a week, or once in two weeks. If there comes a time when the digitalis will not act, it is not due to the fact that the heart has become habituated to the drug, but because the heart is no longer able to respond to the remedy. There is no such thing as a digitalis habit. On the other hand, there are many persons whose lives depend upon digitalis, for without it they would have enjoyed but a short lease of life. The continuous use of small doses does not lessen the efficiency of larger doses if required. Sometimes it is best to stop the digitalis entirely for a week, and then begin with larger doses.

Digitalis may finally produce a true strengthening of the heart, and its use can suddenly be withdrawn without any danger. Doctor Groedel summarizes the matter as follows: "1. In all cases of cardiac insufficiency, when large doses (the administration of which has to be restricted to a short period) of digitalis produce only transitory results, the continuous administration of small doses of digitalis is indicated and is beneficial in most cases. 2. The patients do not become so used to the remedy that they could not do without it. 3. The remedy does not prove ineffective in consequence of patients getting into the habit of taking it."

There are certain contraindications that should be borne in mind; for instance, if the secretion of urine apparently diminishes under digitalis, it is well to stop for a while, and allow this effect to subside. Later, even larger doses may lead to diuresis. Digitalis is not yet completely known, and I hope there may be a few discussions of this important matter of its use as a chronic treatment of chronic conditions.

54 West Fifty-fifth Street.

DISCUSSION.

Dr. Thomas E. Satterthwaite, New York, said that of all the drugs used in cardiac inefficiency digitalis was the best. Here it was our sheet anchor. Whether or not its administration should be continued uninterruptedly was a question to be decided by the conditions present in individual instances. There were some cases in which its continuous employment was essential, and he was confident that the view of its cumulative action had to be reconsidered. Personally, he always made use of the mixed glucoside digitalin. Groedel was fond of giving the drug in its crude form, but by employing digitalin we avoided the disagreeable effects of digitalis. For years he had relied almost exclusively on a special form of digitalin; only occasionally giving a little strophanthiu and nitroglycerin. He considered the form of digitalis administered all-important.

Dr. Hermon C. Gordinier, Troy, stated that he was heartily in accord with Dr. Bishop's views in reference to the use of small doses of digitalis over long periods of time. He believed that these patients establish a tolerance for a certain dosage which seems to keep the heart in fairly good condition. He wished, however, to emphasize the great importance of determining the deficit between the apex beat and that of the radial artery as a guide for the use of digitalis. It was no uncommon experience to find an apex rate of 160 and a radial of 60; showing a deficit of 100. In such cases, digitalis, in physiological dosage, was the remedy *par excellance*. It was particularly in auricular fibrillation that this deficit was so frequently observed, and hence the great value of digitalis therapy in that form of cardiac insufficiency.

Dr. Robert Dawson Rudolf, Toronto, presented two charts showing the difference between the apex beat and brachial pulse in cases of auricular fibrillation; and stated that he was accustomed, in such cases where compensation was maintained, to give digitalis in small doses continuously. To wait for the breaking down of the compensation before resorting to the use of digitalis he thought was a mistake. It was a much better plan to begin the digitalis as early as possible after the discovery of evidences of threatened decompensation, and then continue its judicious use indefinitely. In this way the more serious condition might often be averted. Houchard had for years taught the advisability of thus giving very small doses of digitalis.

Dr. F. E. Stewart, Germantown, Pa., called attention to the difference in strength between the different brands of digitalis preparations on the market, as pointed out by Worth and Hale in Bulletin 48, issued by the Hygienic Laboratory, U. S. Public Health Service. The different brands of tincture of digitalis, for example, varied no less than 300 per cent. To secure uniformity in strength and therapeutic effects it was necessary to employ a standardized product. Attention was also called to the rapid deterioration in fluid preparations of digitalis, due to the action of the oxygen of the air dissolved in the fluid. To prevent this deterioration sealing preparations in ampules was not sufficient unless the air was previously exhausted from the fluid in the ampules by means of a vacuum pump and sealing them *in vacuo*. Thus preserved, the fluid preparations of digitalis kept indefinitely.

Dr. Bishop, in closing, said that when patients with serious cardiac trouble showed a tendency to recurrent decompensation their lives might often be prolonged if they were given digitalis nearly continuously. Without this they had to weather attacks of decompensation, which, in such cases, from time to time came from loss of tonicity of the heart muscle.

AURICULAR FIBRILLATION: ITS DIAGNOSIS AND TREATMENT.

Dr. William Kirk, Troy, N. Y., in this paper said that auricular fibrillation occurred in many forms of cardiac disease but was most common with mitral stenosis and in hearts which were the seat of cardiosclerosis. To the papers of Mackenzie we were especially indebted for the observation that in all cases of complete irregularity of the heart there is entire absence of signs of the normal auricular contraction during diastole. The pauses between the beats bore no relationship to one another, and in this feature the irregularity stood in marked contrast to all other varieties. The second criterion consisted in the absence of a definite and continual relationship between the strength of the beat and the length of the pause, and a weak beat might succeed a long pause. The question had been raised as to whether the ventricular form of venous pulse could be recognized by means of the unaided senses. He believed that it could be in a very large number, in fact the majority, of instances if note were taken of conjoined phenomena, and the first essential was the finding of an irregular pulse. In early and compensated cases, however, the pulsation was rarely recognized by ordinary means, for in such the visible pulsation was usually complex. Resort then had to be made to the graphic method, and by this a venous tracing might often be secured when no venous pulsation could be seen. The general practitioner unfamiliar with the instruments of precision used in the graphic method might recognize the presence of auricular fibrillation ordinarily from a persistent irregular pulse, the rate of which was at or about 120 (which would be almost positive evidence for the diagnosis), and the occurrence of a deficit between the rate of the apex and the radial pulse—a characteristic met with in practically every untreated case. In the treatment the first consideration was the removal of the exciting cause, such as overwork or digestive trouble. Digitalis acted as a specific in a very large proportion of cases, and the guides which rarely failed the physician as an index for the amount of the drug required were the irregularity of rhythm and rate in the heart's action and the deficit between the apex beat and the radial pulse. The choice of a preparation was, in his opinion, largely a matter of taste, provided the one used was known to be effective. Personally he believed there was none superior to the tincture, and he had found that supplied by good manufacturers remarkably constant in quality. It had been his custom to employ a standardized tincture or fluidextract, or the fresh infusion of the green leaves. When the pulse had been reduced to 60 or

70 and the apex beat coincided with the rate of the radial pulse it was wise to discontinue the digitalis for a time and then begin again with smaller doses, or else to continue with smaller doses in order to enable the heart to do its work with the greatest efficiency. The following indications were sufficient to warrant either the discontinuance of the drug or the diminution of the dose: the occurrence of severe headache, with or without nausea and vomiting; the dropping out of ventricular systoles (partial heart block); the occurrence of bigeminy which seemed to be continuous.

DISCUSSION.

Dr. SATTERTHWAITE said that auricular fibrillation was not an uncommon condition, and, as exemplified in the permanently irregular pulse, it could usually be recognized without the use of graphic methods. It was even demonstrable by the sphygmograph, which some years ago had fallen into disuse, because it failed to differentiate valvular diseases. In the matter of treatment he differed from Dr. Kirk only in regard to the preparation of digitalis to be employed. Using the mixed glucoside digitalin, we did not meet with the gastric disturbances so often caused by the infusion and some other preparations of the leaf. A good tincture might be satisfactory, but the tinctures to be had varied greatly in quality and strength. One should depend upon a single good preparation, and not depart from it. The prognosis in this condition varied much with the success of the physician in controlling the patient. It was essential to keep the patient constantly continuously under the influence of digitalis or one of the drugs of the same group. But patients tired of such constant dosing. They would intermit the use of the remedy, and then they were sure to pop off. In auricular fibrillation he believed the trouble to be located in the myocardium, and in many instances due to a lithæmic deposit. One point he would emphasize above all others, and this was that in the permanently irregular pulse the patient should be made to understand that he was always standing on the brink of a precipice, and that continuous use of digitalis, or one of its congeners, was the only protection he had from falling into the abyss.

Dr. BISHOP said that as regards polygraphic tracings and their interpretation there were three points worth noting: 1. A polygraphic curve had nothing to do with a mathematical curve. It might be symmetrical or it might look like a crooked line; one kind was just as good as another for making a diagnosis. 2. The curve was simply a record of events causing waves. 3. The important parts of it to locate were the beginnings of the up-stroke. Taking careful note of these, we might disregard the respiratory curve, the shape of the curve, and everything else.

Dr. STEWART said that in digitalis there were at least four glucosides—digitoxin, digitophyllin, digitalin and digitalein—to which the cardiac action was due. These were accompanied by one or more glucosides (digitonin) having the irritant action of saponin, and like it suspending insoluble bodies in water. The pharmacopœial preparations were made from the leaves, in which digitoxin and digitophyllin were the most important constituents. The glucosides were practically insoluble in water; nevertheless the infusion was a powerful preparation because the glucosides, owing to the presence of the digitonins, were taken up from the leaves by water. However, the active glucosides were soluble in alcohol, while digitonin was insoluble; so that the tincture contained practically the same principles as the infusion, except digitonin. There were several products on the market called digitalin. The so-called "Digitalin, French," was said to consist chiefly of an amorphous glucoside resembling digitoxin in action. The dose was 1-250 grain, rapidly increased until 1-40 grain was taken

daily. Maximum dose 1-30 grain. So-called "Digitalin, German," was said to be a mixture of digitalin (Kiliani), amorphous digitonin, and digitalein. It was extensively used, and the dose was from 1-10 to ½ grain. Then, there was also a preparation known as "Digitalin Crystallized," said to be a glucoside from digitalis, which, according to Merck, who supplied it, "has no physiological action on the heart." Digitalis was said to have a "cumulative" action. This was disputed. Later researches by Hatcher and Eggleson had proved that the former view was correct. Digitalis was excreted slowly. If given too frequently, or in larger doses than warranted by the power of the system to eliminate it, the drug accumulated in the system, and then we had the cumulative effect as a result. Proper care should, therefore, be used in its administration and a standardized preparation always employed.

Dr. Wilcox said that the preparation of digitalis which best showed the action of the drug, as described by Withering, was the infusion. The chemistry of digitalis was extremely obscure. As to the sphygmograph, he had made over 20,000 tracings with it. An expert could tell a factitious curve from one which was not. Personally, he had made a special study of the six drugs of the digitalis group. There was in digitalis a substance which was centrally emetic, though the glucosides caused less gastric disturbance than the infusion. A practitioner, he thought, would get the best results from that preparation which he knew most about.

Dr. Rudolf said that the manner in which digitalis acts certainly could not be interpreted in pharmacological terms. In the human subject its vagus action did not appear to any extent when the drug was given in physiological dose. In fibrillation it had a peculiar action on the ventricle: so that the latter did not respond to this storm which rushed down from the bundle of His.

Dr. Reilly said that sometimes digitalis seemed to fail, and we had another drug, apocynum, which might then prove of service. The eclectics called it the "vegetable trocar." It was very irritating to the stomach, but did not act satisfactorily when given by the rectum. The dose of the fluidextract was from 15 to 20 minims, repeated every four hours. Much of the drug on the market was worthless and irritating.

Dr. Stewart said that the importance of standardizing preparations of apocynum and other members of the digitalis group was well illustrated by three urgent cases of dropsy at the Jefferson Medical College Hospital, which had failed to respond to apocynum. The chief of the clinic procured a standardized fluidextract of apocynum at his (Dr. Stewart's) suggestion; to which the patients responded in a satisfactory manner.

Dr. Kirk said that ordinarily he had used the tincture and also the infusion of digitalis. The general value of the infusion had been impressed in the teaching of both the elder Janeway and his son. As to the glucosides not causing gastric disturbance it had been shown that some emetic effect was produced by any preparation of digitalis representing its pharmacological properties by reason of the central action of the drug. The great question in digitalis therapy was, he thought, in regard to the chemistry of the drug. He believed the fat-free preparations would produce more or less gastric irritation on account of their central effects. As to apocynum, he had employed it with very good results when the patient did not have emesis.

Dr. Wilcox said there could be no doubt as to the result of experiments on central emesis. They had been conclusive as to the central origin of the emetic effect of digitalis and its preparations. The amount of the gastric irritation caused, however, was a question of degree, and less nausea resulted from the fat-free preparations than from the others.

THE ACTION OF PITUITRIN UPON ACUTE HEART FAILURE AND INCOMPENSATE HEART LESIONS.

BY ERNEST ZUEBLIN, M.D.,

BALTIMORE, MD.,

Professor of Medicine in the University of Maryland, Baltimore, Md.

[A Clinical Study from the University of Maryland Hospital, Baltimore, Md.]

Impressed by the valuable results of pituitrin in gynecological and obstetrical work,[1] and based upon the marked physiologic action of pituitrin upon the unstriated and striated muscular fibres, I undertook the present clinical study, especially in cases where, with a failing heart, immediate action becomes necessary, and where the usual remedies at hand, digitalis, strophanthus, etc., require a certain time until their action becomes noticeable, and where a more expeditious remedy is much desired.

Before entering upon the discussion of the clinical observations and physical actions of pituitrin, a brief abstract of the physical findings of patients treated may precede. So far as my knowledge goes, pituitrin had not yet been tried in the category of cases upon which I am to report.

Case I. Jan. 3, 1914. Incompensate endocarditis, general anasarka. P. R., age 62, widower.

When first seen patient was short in breath, propped up in bed, pulse accelerated, irregular, easy depressible; heart limits: apex beat in fifth intercostal space one and one-half inches outside from mammillary line, two inches to right side from sternal border to upper border of third rib. Soft blowing systolic murmur over mitralis, transmitted to left axilla, accentuation of second pulmonic, first aortic sound indistinct, second accentuated, soft systolic murmur over tricuspid, liver enlarged, spleen just palpable. Blood pressure—126 systolic, 82 diastolic, pulse 68.

One injection (1 c.c.) of pituitrin in the evening subcutaneously, next morning (Jan. 4th) patient more comfortable, heart dullness one-half inch to right side of sternal border, apex beat in mammillary line, lower border of third rib. The heart sounds and murmurs are more distinct. Pulse 84, stronger and fuller, intermittency not so marked, occuring between 16-17 beats. Edema disappeared, blood pressure 154 systolic, 86 diastolic.

On Jan. 5th, pulse 84, blood pressure—systolic 156, diastolic 82. Heart limits remained the same, the character of the murmurs did not change. After reduction of the size of the heart, patient was started on digitalis medication (tincture) of which he partook irregularly, min. x. 3 times a day. The patient then, on account of lack of food and lack of understanding, gradually became drowsy and at times even

delirious, so that removal of the patient from his home to the hospital was ordered. He remained there about ten days and died under the symptoms of cardiac and renal insufficiency and pulmonary edema. During that short time of observation the size of the heart had not changed, but probably the heart muscle was too exhausted for complying with its normal physical duties.

A post-mortem was not granted. It may be concluded that in this instance the volume of the heart was rapidly reduced in the transverse diameter, at the base the difference amounted to 2-3 inches, at least, in height the diminution was about ½ inch. At the same time with the increased pulse-rate, the irregularity (arrhythmia) disappeared, an increase in the systolic pressure of about 28, an increase of the diastolic pressure of about 4 mm. was observed.

The possibility may be suggested that, added to the denutrition, general arteriosclerosis, and renal insufficiency, the pituitrin might have unfavorably influenced the cerebral circulation and venous stasis, so that in cases past a certain age the use of pituitrin may not act as efficiently as desired.

Case II. I. H. C., age 33. Diagnosis: acute dilatation of heart, nephritis and lues. Patient an anemic, poorly nourished man, laborer, in sitting position with marked dyspnea, general anasarka, examined on Jan. 13, 1914.

Precordial region bulging, apex beat in 7th interspace anterior axillary line extending 5¾ inches outside to left of midsternal line and 3 inches to the right of midsternal line, upper limits in 3d interspace, absolute dullness reaches the right sternal border, the upper border of the 3d rib, and coincides with the apex beat, at an osculation a double blowing murmur is heard over the mitral and tricuspid area, accentuated 2d pulmonic sound, first sound replaced by a soft murmur; the same condition is found over the aortic area. Pulse 115, respiration 30, one ampule of pituitrin, 1 c.c., injected subcutaneously.

Jan. 14th. Apex beat inside of anterior axillary line, absolute dullness left sternal border, relative dullness right sternal border. The heart sounds are more distinct, also the murmurs. Pulse 95, respiration less accelerated, blood-pressure on the first day 140 systolic, 70 diastolic; on the 15th, 150 systolic and 90 diastolic. The patient feels more comfortable and shows marked improvement. After the pituitrin the patient was given a course of tincture of digitalis, min. x t. i. d., and a gradual improvement became noticeable. During the entire observation small traces of albumen, hyaline and a few granular casts were found. Wassermann reaction markedly positive, luetin slightly indicated.

The heart of the patient in the further course of observation did not show any more dilatation, pulse was still accelerated but gradually came down to 70 regular beats per minute. The blood-pressure showed a slight decrease, 130 systolic, 100 diastolic,, about one month after the one dose of pituitrin was given.

In this instance we are also impressed with the rapid diminution of the size of the cardiac dullness within the first 24 hours after the pituitrin medication. The difference in the transverse diameter was at least 2½-3 inches; the height of the cardiac dullness seemed to be not much influenced. No change in the systolic blood pressure; a slight increase of 20 mm. in the diastolic blood pressure could be noticed, also a slight reduction in the pulse rate.

Case III. Patient M.L., age 43, female. Diagnosis: Chronic endo- and myocarditis after rheumatism. Several recurrences of myocarditis since 1905, examined on March 17, 1914; bulging precordial area, apex beat in anterior axillary line, heart action very forcible, cardiac dullness 5¾ inches to left, 2¾ inches to right from midsternal line, upper border of second rib, transverse diameter 8½ inches.

Patient was given one ampule of pituitrin subcutaneously on March 18th; the cardic area was found: Apex beat inside of anterior axillary line 1 inch outside of right sternal border. The heart action was less irregular, the difference in the transverse diameter of the heart was about 1½ inches. Another injection of pituitrin was given on the same day, and on March 19th the following measurements were obtained:

Apex beat 4½ inches to left, ⅜ inch in the right of midsternal line, oblique diameter 6 inches, height 3 inches; the dullness, found on the previous day, in the 4th interspace in the left pleural sinus, had cleared up, respiration became more distant. Pulse intermittent every 5-6th beat. Pulse-rate on March 17th, 86 to 85; on the 18th 84 to 90; on the 19th, 87 to 80.

Blood pressure before pituitrin medication 130 systolic, 110 diastolic. On the 20th, 110 systolic and 70 diastolic. Before pituitrin medication was administered, the patient received strophantin subcutaneously, but no improvement could be noticed; also digitalis medication seemed to have no beneficial effect whatsoever, on the contrary, the patient presented a higher and more irregular pulse-rate and complained of digestive disturbance.

The urinary output on the 17th was 720 c.c. compared with 1,000 c.c. intake. On the 18th, output 320, input 480; on the 19th, output 960, input 1,000 c.c. That figure was maintained during the next few days of medications.

After the described pituitrin medication the patient did not receive any further medicine. She went through a period of relative well-being. The urinary secretion was as follows:

		Col.	React.	Sp. gr.	Sug.	Alb.	Urea.	Sediment.
May 1, 1914	16	Dark straw		1025	0	0	8.64	Leucocytes
May 2, 1914	14			1024	0	tr.	7.8	
May 4, 1914	30		Acid	1025	0	0	—	Ur. acid
May 5, 1914	30	Dark straw	Acid	1025	—		18.0	Epith. cells
May 6, 1914			Acid	1022	—	tr.	21.6	Leucocytes
May 7, 1914	20		Acid	1023	—	tr.	12.0	

—5/10: Blood pressure=syst. 110; extra systol. 115; diastolic 70.

On May 10th the blood pressure gave systolic 110, extra systolic 115 and diastolic 70. Then the patient had a violent vomiting spell, the reason of which could not be properly ascertained, consequently the patient on May 16th entered into a new relapse of myocardiac insufficiency, cyanosis became apparent, and the physical heart findings were as follows:

Apex beat in 6th interspace in anterior axillary line 7¼ inches to the left of midsternal line, the heart extended to the right 2 inches outside of the midsternal line. The height was 5½ inches, the oblique diameter 11 inches, the pulse-rate was 92, systolic blood pressure 118 (auscultatory) diastolic 78, liver extends 3 fingers below costal margin and 3½ inches to the left of midsternal line. The patient received another dose (1 cc.) of pituitrin; two hours later the systolic blood pressure was 124, diastolic 80; the pulse-rate was 85. Two days later (May 18th) the heart extended in its transverse diameter 8½ inches, in its oblique diameter 9¾ inches and 2 fingers from the right sternal border. The difference with two days previous ¾ inch for

the transverse, 1¼ inches for the oblique diameter. The following day (May 19th) the transverse diameter of the heart amounted to 6¼ inches, 7 inches for the oblique diameter, 4½ inches for the height.

The right relative heart dullness was found inside from the right sternal border, pulse 78, systolic blood pressure 118, diastolic blood pressure 76.

As compared with the previous urinary secretion there was a slight increase of 10 oz. to be observed during the three following days after the pituitrin medication. The patient felt very comfortable until the next relapse. On June 6th the systolic blood pressure was 120, on the 9th a marked arrhythmia of the heart and indistinct quality of the murmurs over the mitral area was noticed.

On the 10th the heart presented the following size: Transverse diameter 5½ inches to the left, 1¼ inches to the right (total 6¾ inches), 8½ inches for the oblique diameter and 4¾ inches for the height was recorded. Previous to the administration of 1 cc. pituitrin the systolic blood pressure was 124, the diastolic blood pressure 90; the pulse was rated at 80 of irregular quality with extra systolis. Two hours after the pituitrin was given the blood pressure was 125, the diastolic blood pressure 90, pulse was 78 and was a little more regular than previously. On the next day (June 11th) the transverse diameter was 6½ inches, the oblique 8 inches, the height 5 inches. The absolute cardiac dullness reached as far as one finger to the right of the left sternal border; the relative dullness extended one finger outside of right sternal border. The heart sounds were still indistinct, distant; the murmurs were found of lesser intensity. The pulse 78, more regular, but not very well sustained. The patient subjectively felt considerably relieved. As a precaution she still remained in bed. On the 13th patient passed a restless night on account of a decayed tooth. The heart condition maintained itself satisfactorily, so the patient on the 17th was permitted to rest in the chair for one-half hour. Following the change the pulse and respiratory rate became increased. On the 18th the patient was allowed to walk five yards, which exercise resulted in a considerable increase of pulse and respiration. Following that a slight discomfort and hypersensitiveness over the cardiac area was observed, so the patient remained quiet. The heart examination on the 20th again showed an increased size of that organ, namely: Transverse diameter in 6th interspace 6½ inches to the left, 3 inches to the right of midsternal line, oblique diameter 10½ inches, upper limits extending to upper border of the third rib, height 6½ inches. The heart action is forcible, gallop rhythm, marked arrhythmia with extra systolic contraction. Rate of apex contraction 111, radialis pulse 84, veinous pulsation synchronous with apex beat. Soft double murmur over mitralis area, marked accentuation of second pulmonic sound recorded. Liver extends 3 inches below right mammillary line with enlarged left liver lobe, 3½ inches to left of median line, 2 inches below xyphoid process. Liver very tender on touch, spleen just palpable below costal margin.

The patient was given another ampule of pituitrin on the same date. The systolic blood pressure was 120, diastolic 90, pulse pressure 32; 24 hours after the pituitrin injection the systolic blood pressure amounted to 138, diastolic 100; pulse pressure 38. Patient felt much more comfortable, the heart showed the following size:

Apex beat sixth interspace 1 inch inside of anterior axillary line, transverse diameter 6¼ inches to the left, 1¼ inches to the right of midsternal line (total 7½ inches), oblique diameter was reduced to 9¼ inches, the heart to 5¼ inches. Absolute cardiac dullness ⅛ of an inch inside of right sternal border, upper border of third rib, relative dullness one finger outside of right sternal border. The heart murmurs are more distinct, rate of apex beat 117, radialis pulse 117, pulse better sustained, fuller; slight dicrotism noted, not to the same extent as previous to the pituitrin medication.

Liver dullness is one finger below costal margin in right mid-clavicular line. The left liver lobe is smaller, extends to 1½ inches outside to left of midsternal line.

Hyperesthesia noted on skin over cardiac and hepatic region. Patient objectively feels more comfortable.

Judging from this brief observation it would seem that also in this instance the pituitrin acted favorably in reducing the size of the cardiac muscle. This reduction amounted to 1½ inches within 24 hours; within 48 hours it reached 3¼ inches in the first instance.

During the second relapse, which happened 60 days later, the transverse diameter diminished in 24 hours ¾ inch, within 48 hours 3 inches. The oblique diameter differed in 24 hours 1¼ inches, in 48 hours 4 inches; the height in 48 hours amounted to 1 inch less (4¼ inches).

During the third relapse, which happened 81 days after the first pituitrin medication and 21 days after the second pituitrin dose, the transverse diameter diminished in 24 hours ¼ inch only, for the oblique ½ inch; for the height hardly any difference could be noted. It must be said that the heart had not dilated so much as when examined on the previous occurrences.

During the fourth relapse, which happened 91 days after the first, 31 days after the second, 10 days after the third attack, and which was associated wtih a considerable dilatation, the reduction within 24 hours amounted to 2 inches in its transverse, 1¼ inches in the oblique diameter and 1¼ inches in the height.

It is our opinion that digitalis being not well borne, and strophanthus not producing the desired results, pituitrin was the only means to allow the patient to rally.

The blood pressure (systolic) showed a slight decrease of 20, and the remarkable reduction of 40 in the diastolic reading at the first instance.

During the second relapse the systolic blood pressure was increased for 6 points only, and then returned to the same rate as previously. The diastolic blood pressure showed a slight decrease of 2 points, then became a little lower than at the beginning.

During the third relapse the systolic blood pressure being relatively high, did not differ more in the high diastolic blood pressure change.

During the fourth relapse the systolic blood pressure showed within 2 hours an increase of 10, and still increased during the next 24 hours. The diastolic blood pressure also increased.

It will be noticed that during the third relapse the difference between apex beat and radialis pulse disappeared, and that the extra systolis became less evident. The general impression of this case as far as prognosis is concerned is unfavorable. The short intervals between the relapses corroborates such an opinion. The first reduction in the size of the heart was most marked in the subsequent observations; the heart was reduced but not to the same extent. The systolic blood pressure, although increased, showing a pulse pressure from 30-38, did not change materially. The pulse did not undergo a considerable change in rate. It is very likely that the reserve strength of the heart muscle has become exhausted, and if pituitrin in such an advanced condition is to give an immediate relief and change, this improvement is very likely not of a long duration. It may be further mentioned, that after some improvement was noticeable after the last pituitary treatment, the patient again became tolerant for strophanthus medication, which before did not act favorably.

Case 4. I. H., carpenter, 66 years of age. Diagnosis: aortic stenosis.

Patient when examined on March 17th presented precordial bulging, apex beat in sixth intercostal space outside mammillary line 5½ inches to left from midsternal line, 2¾ inches to right from midsternal line, 4½ inches in height and 7½ inches in oblique diameter. Muffled mitral sounds with systolic blow, over aorta systolic murmur, over pulmonalis soft diastolic murmur, over tricuspid soft systolic murmur. Hepatic dullness not increased. Patient received one ampule of pituitrin; next day he presented the following heart limits:

Transverse diameter at apex 4½ inches to left, ¾ inches to right from midsternal line. Height, 4 inches, oblique diameter 6 inches. The heart sounds and murmurs are more distinct and of a higher pitched character. Pulse before pituitrin medication was 78, after the pituitrin it came down to 70 and remained at that rate during the patient's stay at the hospital for the next few days.

Blood pressure: Before pituitrin 150 systolic, 110 diastolic; after the pituitrin medication it came down to 140 systolic, 100 diastolic two hours after pituitrin was given. The patient improved rapidly and considerably and was even able to leave the hospital a short time after the pituitrin medication was given.

From this case we have the impression that a considerable reduction in the size of the heart dullness could be observed, namely, 3 inches in the transverse diameter, ½ inch in height, and 1½ inches in the oblique diameter. The pulse did not undergo any considerable change; the systolic as well as the diastolic blood pressure showed a slight reduction.

Case 5. O. R., 60 years of age, bookbinder. Diagnosis: chronic myocarditis, general arteriosclerosis, chronic nephritis, anasarka.

Came under observation March 17, 1914; presented marked dilatation of the heart to 7 inches to the left, and 2½ inches to the right from midsternal line. Heart sounds very distant, double murmur over mitral and tricuspid area, accentuated second pulmonic sound; patient under ordinary digitalis and strophanthus medication did not improve, nor did the subjective and objective symptoms, pulse remained accelerated. Patient rapidly declined, so on March 25, 1914, pituitrin medication was tried. The cardiac dullness on that day was found to be 5¼ inches to the left, 3½ inches to the right from midsternal line, height to upper border of third rib 5 inches, oblique diameter 9 inches. Collection of fluid in left pleural sinus up to the fourth interspace. Patient was very dyspneic, restless and cyanotic. Pulse 100-115, irregular, easily depressible. Blood pressure amounted to 150 systolic, 110-115 diastolic. Albumen and granular casts present at urine examination; 24 hours after the pituitrin medication the limits of the heart presented themselves as follows:

Four and three-fourths inches to left, 1¾ inches to right from midsternal line, height 5 inches, oblique diameter 7½ inches. Blood pressure: 120 systolic, 90 diastolic; pulse 80-82; respiration 28. Patient, besides the reduction in the volume of the cardiac muscle presented some apparent improvement, although it was not very marked; then he declined and died two days after the pituitrin medication. Pulse did not change materially, nor was it possible to control the blood pressure in the suffering patient.

In this case we notice that, notwithstanding the advanced condition, the ad maximum dilated heart showed a reduction of 2¼ inches in the transverse, and 1½ inches in the oblique diameter within 24 hours after the pituitrin medication. It is possible that if the patient had had more reserve strength his heart would have been able to rally, but

as conditions were, the lack of vital energy must be made responsible for the fatal result.

Case 6. I. C., age 19, farmer. Diagnosis: chronic polyarthritis, acute endocarditis with acute dilatation of heart and serous pleurisy.

Heart examined on April 6th. Apex beat in midaxillary line, transverse diameter 8¼ inches, height 5 inches, oblique diameter 8¾ inches. Temperature 101 3-5-103 3-5; pulse 120, 110; systolic blood pressure 90, diastolic 60. A blowing systolic murmur over mitralis inside of mammillary line, diastolic murmur over aorta, double murmur over tricuspid, split and accentuated second pulmonic sound. Patient received on that date one ampule of pituitrin. Immediately preceding the pituitrin medication systolic blood pressure 90, diastolic blood pressure 60; two hours after pituitrin injection, systolic 110, diastolic 90. The following day the heart extended 6½ inches in the transverse diameter, 5 inches in height and 6 inches in the oblique diameter. The systolic blood pressure was 110, the diastolic 100, the pulse-rate was unchanged, also the temperature. The patient, who on the previous day had been apathic and troubled with precordial pains and dyspnea, when examined on April 7th, seemed comfortably propped up, the heart sounds had become louder in character. At a later examination (after two weeks) the patient, having received no other heart medication whatsoever, presented the following measurements:

Transverse diameter 4⅝ inches, height 3½ inches, oblique diameter 5⅜; the different murmurs noticed had not changed in character.

In this instance we also have the impression that the patient, very close to an acute fatal cardiac failure, escaped such a complication, and with the rapid reduction in the volume of his heart, he was able to rally. The difference in diameter in this instance within 24 hours can be summed up as follows:

Transverse diameter 1¾ inches, oblique 2¾ inches, height—no difference. The difference in diameter observed within the first 24 hours after the pituitrin medication amounted for the transverse diameter to 1¾ inches, for the oblique diameter to 2¾ inches, whilst no difference in the height could be noticed. These differences still increased, namely: for the transverse diameter 3⅝ inches, for the oblique 3⅛ inches, for the height 1½ inches.

It seems that the beneficial action of the pituitrin was not transitory. Rest, of course, must have contributed to a favorable result. Rest alone, however, seemed not to have been sufficient for the reduction in the volume of the heart. At the present time, six weeks after the one pituitrin dose, the patient seems well and is able to walk around without any symptoms of cardiac failure.

Case 7. W. H. M., age 61. Previous history: malaria, rheumatism, patient very irritable, auditory hallucination, insomnia, constipation, piles. Examined Jan. 23, 1914. Colitis mucipira, cardiac arrhythmia, extra systole, both tricuspid and aortic valves diseased (tricuspid insufficiency, regurgitation and aortic obstruction), enlargement of the heart to right and left, apex beat 5¼ inches to left from midsternal line, upper border of third rib one inch outside to right from midsternal line, oblique diameter 7½ inches. Absolute dullness reaches one finger inside of right sternal border, relative dullness two fingers of right sternal border. Over mitralis a rumbling first sound is heard, over tricuspid and midsternal line in fifth interspace a double murmur is heard, over aorta a soft systolic blow, which is transmitted towards pulmonalis, marked, accentuation of both second aortic and pulmonic sound. Systolic blood pressure 154, diastolic 98. Patient is given 1 c.c. of pituitrin subcutaneously; the succeeding examination shows apex beat 3⅝ inches outside of midsternal line in sixth

interspace, oblique diameter 5⅝ inches, relative dullness lower border of third rib and middle sternum, absolute dullness one finger to left from left sternal border. The murmurs stated are more intense. During that time the patient was given besides pituitrin sodium nitrite; subjectively the patient is much improved. Arrhythmia is still present, pulse ranges between 81 and 90, systolic blood pressure 154, diastolic 82. Pulse pressure 72. The maximal intensity of the murmur is located mostly over the right sternal border in the second intercostal space with propagation towards the large vessels and downwards to the tricuspid valve. Also in this case we meet with a striking diminution in the diameters of the heart, namely, 2⅝ inches in the transverse, 1⅝ inches in the oblique diameter, and a slight reduction of the diastolic blood pressure.

ANATOMICAL AND PHYSIOLOGICAL REMARKS ON THE PITUITARY GLAND AND ITS CHEMICAL SUBSTANCES.

The pituitary gland and hypophysis are situated in the sella turcica. Composed of different parts, the adenohypophysis, eventually still found in connection with the pharyngeal hypophysis, develops from the entoderm,—also called the pituitary body.[1] The second constituent is the neuro-hypophysis, or the hypophysis proper, and develops from the nervous system. (Weidersheim,[2] Steudel.[3]) Only within the last few years our conceptions of the physiological importance of this organ have become better defined. So since Marie's[4] description of acromegalia, and the discovery by Marinesco[5] of the tumor of the pituitary gland in 1891, great interest in the functions of the organ has been aroused. The removal of the pituitary body itself, in the animal experiment, causes rapid death, which is preceded by muscular tremors, slow pulse and respiration, and fall of temperature.[6] The section of the hypophysis and its extirpation is also fatal, according to R. Hoffman,[7] by important changes in the spinal fluid, whilst other investigators (J. E. Street and C. R. Allen[8]) consider the hypophysis of no vital importance, yet this operation caused pathological changes in the pancreas, atrophy of the testicles, gain in weight. In young animals the absence of the pituitary gland favors retarded growth, persistency in infantile characters, hypertrophy of the thyroid, atrophy of the gonads, diminution of libido, accumulation of fat in the omentum and in the retroperitoneal tissue, as recorded by Benedict and Homans.[9] There has within the last few years accumulated quite a considerable literature on that interesting chapter, for the discussion of which I would refer to a publication on the way of preparation. Only a few writers may be mentioned: Cushing,[10,11] R. A. Schaefer,[12,13,14] Schlimpert,[15] Gavin,[16] Mackenzie,[17] Noel Paton and Watson,[18] Paulesco.[19]

Among the other manifestations following the lack of pituitary gland, the lack in gain of weight, thickening of the skin, tendency to alopecia, adiposity (hydrophysary), lack of development of the gonads, drop of temperature, disturbance of heat regulation, decrease in the

heart and respiratory rate will be remembered. Also a considerable decrease in the exchange of carbon dioxide could be demonstrated.

Since we know that special diseases ascribed to disturbances of internal secretion are closely related to the function of the pituitary gland, as pregnancy (W. Holde,[20] Roessle,[21] Ashner,[22] and others), castration, and thyroidectomy (Zuckermann[23]) called for by hypertrophy of the organ, and as thyroid and pituitary gland have a compensating effect upon each other, we must admit that the function of that organ can have no small importance for the well-being of the individual. The activity of the gland seems to start at an early period of developing life (Schlimpert[24]), and, according to the anatomomicroscopical and chemical findings, changes from the normal gland take place all the time (Kohn Stumf, Toelken, Vogel, Ashoff[25]), which according to sex show many differences (Erdheim, Ashoff[26]).

This view is also supported by the chemical analysis of the different substances obtained from that organ and by clinical observation. We have not reached a complete understanding in that matter as yet and the future may bring new material to our knowledge. The first experiments with the extract of the hypophysis were undertaken by Oliver and Schaefer in 1895 [27]. They reported, after the intravenous injection, a considerable rise in blood pressure. This discovery was followed by the effect of the substance upon the uterus by H. H. Dale[28] in 1906. The active principles were obtained from the posterior part of the organ (neurohypophysis) and called hypophysin, whilst the extracts obtained from the glandular portion should have no such effect. Schickele,[29] H. Fuehner,[30] Oliver and Schaefer explained the effect obtained by the action of the extract upon the arterioles, which effect is quite different from that observed when epinephrin is given in different ways (chemically, biologically). This difference since then has been confirmed by various writers (P. Rohmer,[31] Kepinow,[32] Froelich and Pick,[33],[34] Nimulescu,[35] Matthes,[36] etc.). Chemically, hypophysin or pituitrin or pituglandol (M. Winkel[37]) is a substance insoluble in ether and in alcohol. It can be dialyzed and does not undergo destruction by heat and reducing agents. Whilst in mammals these effects were confirmed, in birds, instead of a vasoconstriction a vasodilatation resulted from the injection, and the dose repeated within one-half to one hour caused by a constriction of the vessels (Howell[38]). A similar fact was observed by O. Pankow[39] on rabbits; first depression followed by a rise in the pressure. Also mentioned by Schaefer and Herring[40] in their experiments. So the existence of two different substances was supposed, one acting as a dilator, the other as a constrictor. This fact was established by Popielski,[41] who in using separate extracts from the glandular, as well as from the posterior part, succeeded in the separation of two different substances, namely, the so-called vasohypertensin and the vasodilatin. The former was

found to act intermittently upon the pulse action and upon blood pressure. We have to go even further in the differentiation of the effects upon the different vessels, as in mammals hypophysin has been found a dilator upon the renal artery, and a vasoconstrictor upon the coronary arteries. Fuehner,[42],[43] in his experiments isolated not less than eight different substances from the infundibular part of the gland, which are represented as crystallized basic substances (hypophysin Hoechst, B. A. Houssay[44]). The effect of hypophysin, studied by Klotz,[45] and Pankow, can be subdivided into a rise of pressure, for a short period only, which is to be succeeded by a longer lasting, sometimes deep depression, which finally is followed by the characteristic and durable rise of blood pressure. This has also been confirmed by Fuehner[42] and substantiated by interesting charts and curves. Hypophysin attacks the smaller vessels, which answer by a contraction, and cause a rise in the pressure and so favorably influence the heart. Pankow[39] in his paper also noticed symptoms of anaphylaxis. Whilst this fact remains not confirmed, Houssay in a second injection did obtain a lesser effect than with the first application. According to the same author the substances contained in the posterior part of the gland are very powerful and last much longer in their vasoconstrictor effect than any other substance with local effect. The effect of pituitrin upon the heart muscle itself is not yet fully understood. It is generally admitted that we have to deal with a direct action upon the heart muscle itself (Pankow[39]), the effect of which is not changed by intact or severed pneumogastric nerve. Different from epinephrin, vagotomy followed by pituitrin does not cause acceleration of the pulse rate. Hypophysin seems to act upon some structures peripherally, through the endings of the augmentor nerves, stimulated by epinephrin. According to Watson and Noel Paton,[18] epinephrin acts not upon the heart muscle itself, but hypophysin stimulates the ventricles. Such action seems plausible in analogy to the experimental results obtained with uteri studied under the action of pituitrin (H. H. Dale,[28] Report Russ, Congr. o. Gynecolog. and Obstetrics,[46] Malinowski,[47] Fuehner,[30] Senge,[48] P. S. Pittenger,[49] F. E. Stewart,[49] etc.). In birds, in the absence of the augmentor fibres and their terminations, hypophysin increases the contraction of the ventricles.

A further action of pituitrin upon the respiratory organs should not be forgotten (Pankow,[39],[50] Froehlich and Pick[31]), where in rabbits after the intravenous injection of hypophysin a transitory check of the respiration could be observed. The inspiration ceased entirely, the expiration was spasmodic. Bronchial spasm, with acute distention of the lungs, in guinea-pigs was also reported, which condition could be relieved by stimulation of the pneumogastric nerve (atropine). These manifestations were attributed to the stimulation of the respiratory center in the medulla oblongata, under the influence of the vasotonic effect

upon the vessels supplying that section of the nervous system. Hypophysin in its action upon the pupil of the enucleated eyeball of the frog, resembles that obtained with adrenalin. As a stimulant to the motor function of the intestine, the work of Ott and Scott,[51] Musser,[52] and Udaondo[53] may be cited. As a diuretic the observations of Magnus and Schaefer, Schaefer and Herring, and R. v. d. Velden[54] must be mentioned. This action is attributed to a dilatation of the renal vessels, which is followed by an increase in the size of the kidneys. Likewise, the pituitrin and allied products from this hypophysis increase the tonicity of the bladder in dogs. The action upon the uterus is partly attributed to the direct stimulation of the muscular fibres, but also explained by a stimulation of the motor pelvic nerves, those that supply the motor impulses to the uterus, namely, the hypogastric nerves. The action of pituitrin upon the milk glands is still under discussion.

Metabolism, normal and pathological, is also influenced by pituitrin. With regard to the proteid catabolism, a marked emaciation can be observed (Manson and Johnson, Falta, Crowe,[55] Cushing,[10] and Homans). Hyperglycemia and glycosuria (Borchardt, Cushing and Goetsch[56]; not endorsed by all authors,—Musser[52]) may be briefly mentioned. Further, there can be observed an increase of the respiratory quotient (Falta). Subcutaneous injection of pituitrin, according to Elfer,[75] does not seem of harmful influence upon the proteid metabolism, but favors a transitory retention of phosphor, magnesia and calcium compounds. With regard to disturbed metabolism the papers of B. A. Houssay,[44] R. v. d. Velden,[54] Römer,[58] are of interest, namely, in the instance of diabetes insipidus. The latter author in animal experiments and in human patients was able to demonstrate that the extract of the intermediate part of the pituitary body decreases diuresis, which fact throws an interesting light upon the possible etiology of the disease as an insufficiency of the intermediate part of the gland. His therapeutic results obtained with that isolated product seem to vindicate such a hypothesis, which, however, will require more experimental confirmation before being generally accepted. The pituitary body, under the influence of general infections seems also to suffer. At least in diphtheria, human and experimental, several facts seem to speak in favor of the harmful action of the toxin upon that organ (H. Creutzfeld and R. Koch,[59] R. Koch[60]); also the favorable action reported on pituitrin medication in cases of rheumatic arthritis (C. Wallace and F. S. Childs)[61] would suggest a relationship of that organ to these and other infectious diseases. As seen from this summary review of the physiology and pharmacology of the pituitary gland we may conclude that that organ certainly has some if not a great importance for the human being.

With regard to our subject under discussion, we may ask whether

any definite contraindications exist as to the use of pituitrin and hypophysin. The obstetricians were the first to put up a list of cases where from a general standpoint these remedies should not be used without incurring dangerous or fatal conditions. The following authors did not think it advisable and cautioned against such conditions:—

In heart diseases, Hofstätter,[62] Malinowski,[47] Puppel[63]; compensate and incompensate diseases of the valves, Hofstätter[62]; coronary sclerosis and stenocardia, Vogt,[64] Wagner.[65]

In arteriosclerosis, more or less advanced, Hofstätter, Vogt.[64]

In nephritides, Vogt,[64] Malinowski,[47] Wagner,[65] Puppel.[63]

In hypertension, exceeding 40 mm. pressure, Vogt.[64]

In very nervous, hyperexcited individuals, Hofstätter.[62]

Puppel's caution as to their use in eclampsia does not tally with the statement of Schlossberg,[66] who obtained good results with pituitrin in this condition.

In reporting my observations on the action of pituitrin on the heart muscle, I am fully aware of the difficulty to judge the situation as yet. As a casual contribution to our therapeutical aims, the question is at least of interest. If in seven partly very serious cases with decompensated heart, only two terminated fatally, while the other five could be successfully helped, it would seem that pituitary medication would at least be worth a further study. With regard to the two fatal cases, considering their too far gone condition, their advanced age, and possible arteriosclerosis of the vessels, with nephritis, probably in connection with the venous stasis, and in the first case the possible uremic condition, the chances for recovery were very small. But still the question remains to be answered by more clinical observation, when and under which circumstances do we safely prevent a worse condition in giving pituitrin. It would not be wise to deduce from a few observations clinical laws for the future. From the preceding remarks on the pharmacology of pituitrin we may learn that a too extensive dose of pituitrin in advanced age may result in a sudden harmful rise of pressure. Of course the sudden change may be undesirable for the vessels of the brain and may be complicated with hemorrhage and apoplexia. In a weakened and tired-out myocardium it is evident that we will rapidly reduce the distended organ to a more normal size; the one difficulty remains to be found out to what extent has the reserve strength of the heart muscle become exhausted. In these cases, even with little reserve strength left, there remains a possibility that pituitrin may help the immediate needs and that after the diminution of dilatation has become noticeable, the patient, before intolerant to the ordinary cardiac stimulation, may again be able to stand a careful test with these routine remedies. In doubtful cases, where we have reason to admit sclerotic changes, especially sclerosis of the coronary vessels and stenocardia,

we would do well to remember that pituitrin may hasten a fatal result. This is based on clinical observation, where in prolonged spasm of the coronary vessels, which in their aspect show obstructive endarteritis, an ischemia of the heart muscle would call for the symptoms of stenocardia.

Clinically and experimentally the problem of pituitary medication seems to be of great interest. I am aware that besides the clinical bedside study, the entire arsenal of diagnostic means for cardiac lesions should be called for, including electrocardiagram, sphygmobolometry, etc. (Th. E. Satterthwaite[67]), in order to throw some more light upon the fine biological and pharmacodynamic affinity between pituitrin and the heart muscle. Under present circumstances such studies were impossible; so the present paper has to be limited to the clinical recommendation of pituitrin in acute heart failure with acute dilatation. Our studies with our material of cardiovascular patients, upon which pituitrin is used, is still going on. This seems justified by the results observed and also in order to determine the therapeutic indications, and when and where pituitrin can be safely recommended without inflicting serious harm to the patient. In connection with pituitrin medication on a series of patients we may remember the work done in this line by Musser.[52]

It seems that pituitrin may be helpful in other pathological conditions than the heart. I would only briefly allude to cases of chronic asthma and hay fever, in which the attacks persisting for years and years, resisting all therapeutic medication have ceased entirely for months. Although encouraged by these surprising results with the combination treatment by epinephrin and pituitrin, I do not feel justified to present an extensive report on these cases I have treated successfully, before more time has passed in which to judge the situation The combination of epinephrin and pituitrin is favorably endorsed by different authors (Houssay,[44] Kepinow,[32] Froehlich and Pick,[33] Nimulescu,[53] Matthes,[36] P. Rohmer[31]). The last author in a recent paper reaches similar conclusions to mine in the use of pituitrin in cardiac diseases. Among other experiences with pituitrin I would also briefly allude to the result of my present study of pituitrin in cases of typhoid fever. In instances of tympanites uncontrollable by any other means, and where overdistention increased the danger for hemorrhage and perforation, pituitrin 1 c.c. injected subcutaneously, relieved such a condition in a few hours. We resorted to the same medication in two cases of intestinal hemorrhage in typhoid. Rapid disappearance of the blood from the stools was the result; the patients rallied and made a normal recovery. It is my impression that in these few instances the pituitrin medication saved a precarious situation, and if we had not taken the chances of a yet untried application, these cases would have to figure on our death records.

LITERATURE.

(The literature on the pituitary body, its pharmacodynamic properties, and indications has within a few years become so extensive, that in the present paper only some of the chief references can be given. The subject will be dealt with later in a more complete manner.)

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DISCUSSION.

Dr. Rudolf said that in the treatment of cardiac conditions there was one principle well worth remembering. In using epinephrin and pituitrin would we have sufficient reserve power left in the heart? He was convinced that these remedies do exhaust the reserve power. In acute conditions there was plenty of reserve to draw upon, but such was not the fact in terminal cases, and such an agent might kill very promptly. He believed, therefore, that epinephrin and pituitrin should be used only in emergencies and when there was plenty of reserve power.

Dr. Osborne said it was certainly very important to know how to take care of the heart. He had used pituitrin frequently in the past two years, and felt convinced that it was a very valuable remedy. He had never known it to do any harm. In cases of double pneumonia it had done good; here it seemed to help the right heart. It raised the blood pressure in a nice way; not the rough way in which epinephrin did this. He would question the propriety of giving epinephrin and pituitrin in the same injection.

Dr. Reilly said he thought it a mistake to suppose that epinephrin or pituitrin, when injected intra-muscularly, would raise the blood-pressure in normal humans. They might do so if given intra-venously. He had found that in 40% of the cases of intestinal obstruction in which pituitrin was employed, contractions with pain about the site of the obstruction were produced; while in the rest of the cases no result was noted. In the intestinal paresis following operation 2 and 3 c.c. had been given, with no ill effects from the drug. In the *British Medical Journal*, last October, a good observer had reported seven or eight cases in which pituitrin was given by the mouth, for the relief of emphysema and asthma, with encouraging results, and in one case he himself had used it in this way with good results.

NORMAL HORSE SERUM IN HEMORRHAGE FROM NOSE AND THROAT OPERATIONS.

A Series of Experiments as to the Coagulation Time of the Blood, Before and After Injections of the Serum.

BY CLEMENT F. THEISEN, M.D.,

ALBANY, N. Y.,

AND N. K. FROMM, M.D.,

ALBANY, N. Y.

For several years the writers have been using injections of blood serum for the control of hemorrhage in nose and throat operations. In a recent paper,[1] a series of cases of hemorrhage after tonsillectomy and other operations were reported, in which, after other methods failed, the bleeding could be absolutely controlled by the use of the serum. In all the cases reported at that time, the serum was not used until the hemorrhage had already started. In the series of cases on which this paper is based, the blood serum was used before operating, when we expected to have an unusual amount of bleeding.

Weil,[2] whose researches in hemophilia were so largely responsible for the present status of serum therapy in this disease, reported, in 1907, a series of four cases treated with serum. In one of his cases a polyarthritis with rapidly developing subcutaneous hemorrhages, epistaxis and hematuria, the patient was given an intravenous injection of fifteen c.c. of fresh beef serum, and was cured.

The most complete of the more recent papers on this subject is that of Goldstein[3]. The following details were carried out in each case: Within twenty-four hours previous to the time of operation, 1, a physical examination of the patient was made; 2, the systolic and diastolic blood pressure recorded; 3, the hemoglobin percentage was noted; 4, the coagulation time was ascertained of blood obtained from the lobe of the ear; 5, where the time limit of the coagulation exceeded seven minutes, a hypodermic injection of ten c.c. of normal, sterile horse serum was given; 6, in each case where the serum injection was made, the coagulability of the blood was again tested just prior to the time of operation. In practically every case the coagulation time was reduced after injection of the serum from one to two and one half and even three minutes.

In the writer's cases, the serum injections were given irrespective of the coagulation time before operating. They were given when we expected from a history of severe cases of hemorrhage in the patient's family or of severe spontaneous hemorrhages in the patient, an unusual amount of bleeding after operating.

It has been recognized that the coagulation principle of the blood is dependent on the action of thrombin, the so called fibrin ferment. Voegtlin and Macht,[4] however, have isolated from the blood and the adrenal cortex, a new vasoconstrictor substance, and it is quite possible that the action of the serum in controlling and preventing bleeding is due to this agent. This powerful vasoconstrictor substance was extracted from the blood in the following way: Defibrinated blood serum of oxen and pigs was treated with dehydrated powdered sodium phosphate or sodium sulphate. The dry mass was pulverized and extracted with water free chloroform. This chloroform extract was evaporated to dryness and then treated with absolute methyl alcohol. On evaporation, a white crystalline residue was obtained, very sparingly soluble in water, but freely soluble in chloroform, acetone, hot ethyl alcohol, and other organic solvents. Study of the action of this substance on the bloodvessels of cold and warm blooded animals and on the heart, led to extremely interesting observations. It was found that it was a powerful vasoconstricting agent; a minute quantity, 1/300 mg., producing a marked and long lasting (over an hour) constriction of the vessels of a frog's hind legs.

By exactly the same method, the authors extracted a similar substance from human blood serum. It was found that the quantity of extract corresponding to one c.c. of human serum diluted with 500 c.c. of Locke's solution, was sufficient to produce a very marked constriction of the rabbit's bloodvessels, which showed that the substance must be present in quite an appreciable amount in normal blood. Their work on this subject, and the isolation of the crystalline substance already described, together with a study of its chemical, physical, and physiological properties, justifies them in regarding it as a substance with a pharmacological action different from epinephrine or from any other body hitherto obtained from the blood. While they have not yet been able to isolate enough material for a complete chemical analysis, all the observations so far made on the physical and chemical properties of the body seem to point to its relation to cholesterin on the one hand, and to the cortex of the adrenal gland on the other. Tha this substance may be of considerable clinical importance, is not unlikely in view of the observations of Gubar, who noted that the vasoconstricting properties of blood serum vary in different pathological conditions, being increased in nephritis, for instance, and diminished in other diseases.

It was shown in the foregoing that it is possible to isolate from the

blood of man and other mammals, a substance, the nature and properties of which compel the authors to regard it as a lipoid and closely related to cholesterin. For a long time it has been known that blood serum and the defribrinated blood of different animals exert a vasoconstricting action on bloodvessels. It was formerly considered that this vasoconstrictor effect was due to epinephrin; it has been proved, however, by O'Connor[5] and others, that systemic blood, with the exception of the blood from the adrenal veins, does not contain epinephrin. O'Connor first suspected there must be another vasoconstricting substance in the blood.

In our own observations, the coagulation time was estimated by the coagulometer of Russel and Brodie, as modified by Boggs. The apparatus consists of a moist chamber with a glass bottom, which can be placed upon the stage of the microscope, while the upper surface is a truncated cone of glass projecting downward into the moist chamber. The lower surface of this is four mm. in diameter, and on it is placed a drop of blood, care being taken that the drop only just covers surface; hence it is always of the same size. The glass is then quickly fitted into the moist chamber. Through the side of the chamber projects a fine tube, through which, by means of a bulb, a gentle stream of air can be directed against the blood. With the low power of the microscope, the cells are then watched, while being agitated, until they are seen to move in clumps. As little blowing, and at as long intervals as possible, should be done. The corpuscles will at first move freely and independently of one another, then in clumps at the periphery. As the process of coagulation continues, the masses of corpuscles will no longer move in the drop, but the drop changes shape en masse, the corpuscles showing first an elastic concentric motion and finally an elastic radial motion; that is, the current of air will cause the masses of corpuscles to move toward the centre, and to spring quickly back to their original position when the current of air ceases. This is taken as the end point and indicates coagulation. Using this instrument, Slader, working with Emerson, found the normal end point to vary from three to eight minutes, an average of five minutes and six seconds.

Of the series of cases in which injections of serum were given, only eight will be reported. We had reason to believe that in all these there was a decided tendency to bleeding, in fact the history in some of them proved this, and in four of them there was an undoubted hemophiliac diathesis (Cases II, VI, VII, and VIII).

Case I. T. B. W., aged twenty-seven years. Operation, radical tonsillectomy and adenoidectomy. In all the cases the radical tonsil operation—dissection and snare—was performed. Cocaine anesthesia. In this case there was a history of severe nasal hemorrhage, severe bleeding, when teeth were extracted and after trivial wounds. Ten c.c. normal horse serum was injected fifteen hours before operation. There was practically no bleeding during the operation, and there was no oozing from the tonsillar

fossæ afterward. In all there was less than a half ounce of blood lost.

Case II. A. S., girl, aged nine years. Operation, Child's Hospital, tonsillectomy and adenoidectomy. Ten c.c. serum administeread eighteen hours before operation. In this case there was a decided hemorrhage diathesis, and two of the brothers were subject to profuse nasal hemorrhages, difficult to control. A practically bloodless operation was performed, and there was no blood lost after the operation.

Case III. M. E., girl, aged nine years. Operation, tonsillectomy and adenoidectomy, Child's Hospital. Same amount of serum administered as in the last case, fifteen hours before operation. In this case the patient had been subject to bad nasal hemorrhages. Very small amount of bleeding during and after the operation, about one-third the usual amount.

Case IV. A. McL., girl aged ten years. Operation, Child's Hospital, tonsillectomy and adenoidectomy. Ten c.c. serum given twenty hours before operation. Practically no bleeding during or after operation.

Case V. A. L., boy, aged nine years. Operation, Child's Hospital, tonsillectomy and adenoidectomy. Ten c.c. serum injected night before operation. Less than one-third the amount of usual hemorrhage.

Case VI. H. J., boy aged seven years. Operation, Child's Hospital, tonsillectomy and adenoidectomy. Ten c.c. serum given fifteen hours before operation. In this case there was a decided hemophiliac diathesis, in fact in the entire family, there was a tendency to severe spontaneous hemorrhages. Very slight bleeding during operation, and no oozing from tonsil wounds afterward.

Case VII. H. Van A., young man, aged twenty years. Strong looking farmer's son, but with the slowest coagulation time of any of the cases. History of excessive bleeding, day at a time, when had teeth extracted, and severe nasal hemorrhages. Hemorrhagic tendency in family. Operation, St. Peter's Hospital, tonsillectomy, middle turbinectomy, and currettage of anterior ethmoid cells. Cocaine anesthesia. Patient had had chronic ethmoiditis for years, with severe periodical headaches on same side, and ocular disturbances. Middle turbinate large and cystic. Fifteen c.c. serum injected seventeen hours before operation. Ten per cent. cocaine used with a very little adrenaline during operation. Practically no bleeding during the tonsillectomy nor afterward.

In the ethmoid operation, which is usually attended by profuse bleeding, there was also very slight loss of blood. No nasal tampons were used. So far as possible, no adrenaline, peroxide, or other agents for the control of hemorrhage were used during operations, so that we could get a better idea of the action of the serum.

Case VIII. J. S., boy, aged nine years. Operation, Child's Hospital, for chronic suppurative otitis media, diseased tonsils, and adenoids. This was a straight case of hemophilia. Father has had an extremely bad case of purpura hæmorrhagica. Father's brother's child, a boy, bled to death as a result of uncontrollable nasal hemorrhage. He was sent to the Child's Hospital and given fifteen c.c. of serum about sixteen hours before the operation, tonsillectomy and adenoidectomy. In this case we surely expected a postoperative, possibly fatal hemorrhage, but to our surprise had a very slight amount of bleeding during the operation, and none afterward. All the children operated on were kept under observation for a long time after the operations.

In these eight cases the average coagulation time before injection of the serum was 5.18 minutes, and after injection 4.12 minutes, making an average decrease in coagulation time of 1.06 minute. General anesthesia

was used in all except two cases. Normal horse serum should be used whenever the tonsil operation must be undertaken in a subject of the hemorrhagic or hemophiliac diathesis. When it is used in such cases, prior to operation, the operator leaves his patient with a feeling of much greater security, and with the probable assurance that he will not be called to the hospital at one or two o'clock in the morning, to deal with an alarming hemorrhage.

Judging by a search of the literature, the much heralded danger of anaphylaxis is practically nil, when as in our cases, only one injection of serum had to be used. No claim is made that blood serum is infallible. In some cases it might fail. It must, however, be considered at least a valuable addition to the remedies for controlling hemorrhage. In the cases noted in the following table, the blood drop was always taken from the ear lobe under aseptic precautions.

					Coagulation time in minutes			
Name.	Number.	Sex.	Age.	Amount injected.	Before injection.	After injection.	Decrease in coagulation time.	Operation.
T. B. W.....	1	M.	27 yrs.	10 c.c.	4	3	1	Tonsillectomy
A. S.....	2	F.	9 yrs.	10 c.c.	5½	4¼	1¼	Tonsillectomy, adenoidectomy
M. E.....	3	F.	9 yrs.	10 c.c.	4	3½	½	Tonsillectomy, adenoidectomy
A. McI.....	4	F.	10 yrs.	10 c.c.	4	3½	½	Tonsillectomy, adenoidectomy
A. L.....	5	M.	9 yrs.	10 c.c.	4¾	3¼	1½	Tonsillectomy, adenoidectomy
H. J.....	6	M.	7 yrs.	10 c.c.	5½	4¾	¾	Tonsillectomy, adenoidectomy
H. van A.....	7	M.	20 yrs.	15 c.c.	7¼	6	1¼	Tonsillectomy, ethmoid, turbinectomy
J. S.....	8	M.	9 yrs.	15 c.c.	6½	4¾	1¾	Tonsillectomy

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DISCUSSION.

Dr. OSBORNE said that before using diphtheria antitoxin we should carefully inquire as to whether the patient was susceptible to horse emanations and the like.

Dr. REILLY said that in the hemorrhages occurring in the course of chronic intestinal nephritis, horse serum did not appear to have any value. This particularly applied to the nasal hemorrhages which were so troublesome in that disease. He did not think that serious anaphylaxis was at all common. It was a clinical curiosity, and was about as rare as death from a small hypodermic of morphine.

Dr. Zueblin called attention to the occurrence of even fatal anaphylaxis after administration of diphtheria antitoxin, and went on to say that he would like to emphasize the desirability of employing the serum of different animals in the hemorrhages occurring in typhoid and other diseases. Personally, he had resorted to the use of serum, not only of the horse, but also of rabbits, guinea pigs and other animals, and of liver extract. Whether or not the serum acted directly upon the blood itself, or whether as a general stimulant upon the phagocytes and the production of leucocytic ferment (thrombin), or in acting upon the lipoids and cholesterin producing hemorrhage, we did not know. In the hemorrhages of typhoid, according to his personal clinical experience, he thought the use of serum might prove of great service.

Dr. Stewart said he had had excellent opportunities for knowing something about the untoward symptoms sometimes following the injection of preparations of horse serum, and that he was called in consultation in one of the earlier cases of sudden death following the use of diphtheria antitoxin. At that time very little had been written on the subject. Shortly afterwards, Drs. Rosenau and Anderson, of the Hygienic Laboratory of the United States Public Health Service, investigated the subject and published bulletins giving the results of their investigations. Since that time an enormous amount of literature had accumulated on the subject of "anaphylaxis" or "protein hyper-susceptibility." It was now quite generally known that certain individuals are hypersensitive to the protein of alien serums, and manifest this susceptibility by urticaria and other symptoms following the injection of antitoxic and other serums. It had been noticed that persons subject to bronchial asthma sometimes manifest this susceptibility to an unusual degree. In such cases symptoms of embarrassed respiration immediately followed injections, and fatal results might ensue. So far as he knew, all of the fatal results reported had followed the initial injection, and no deaths had occurred from a second dose on account of sensitization by the first dose. Rosenau and Anderson had demonstrated that guinea pigs may be "sensitized" to alien proteins, so that when a second injection is given after a period of twelve to fourteen days, the animal dies suddenly. The primary cause was failure of respiration, which was preceded by intense itching and other symptoms resembling those observed in cases of sudden death in man resulting from the injection of horse serum. It was therefore concluded that such sensitization may occur as a result of the injection of diphtheria antitoxin and other serums in man, and, consequently, a kind of hysteria on the subject had been gradually extending throughout the medical profession. This scare was unwarranted and was to be regretted. Hundreds of thousands of persons had been injected with horse serum preparations, and the fatalities were limited to possibly twenty cases. As already stated, with possible exceptions, these cases had been confined to the first injections. However, the fact that fatal results may occur after the injection of diphtheria antitoxin or other serum, was sufficiently alarming to warrant the amount of investigation of this important subject now going on. The cause or causes of "serum sickness" and anaphylactic phenomena yet remained to be discovered. A number of theories had been advanced to explain them, one of the latest of which was that of Victor Vaughan, who believed that the various phenomena are produced by a poison split off from the protein molecule by parenteral digestion. If this theory was correct, it followed that the anaphylactic symptoms were merely phenomena of the immunizing process.

The term "horse asthma" had been adopted to designate the asthmatic attacks following exposure to horse emanations. The cases of sudden death were usually in persons subject to attacks of horse asthma. The presence of this form of asthma contraindicated the use of horse serum preparations. In France it was customary to inject a small dose of the serum before using the regular dose, as a precautionary measure. This method was recommended by Besredka of the Pasteur Institute. Besredka main-

tained that the clinician need not concern himself as to whether or not the patient is already sensitized from a previous injection of serum. He recommended that this method should be universally adopted. It consisted in injecting the patient with a fraction of one cubic centimeter previous to the injection of the regular dose, to be followed in the course of an hour or more by the remainder of the serum constituting the dose, if no untoward symptoms developed. He believed that this procedure produces an anti-anaphylactic condition in every case. Besredka's views were apparently not generally known in this country, but they are certainly worthy of consideration.

Dr. Morris said that if any individual man was allergic to the horse or the cat he was always aware of this condition. If in performing tonsillectomy we cut the carotid, we always knew it. He had met with one instance of this. A fibrous tonsil was drawn forward with a tenaculum, and a slice was taken out of the carotid artery. The stream of blood spurted to a distance of several feet. The patient, however, did not know to this day that anything unusual had happened.

Dr. Rudolf said he had tried a great many agents for controlling hemorrhage. Calcium salts had been found to have practically no effect. The coagulation-time of the blood, he thought, was shortened more effectively by hemorrhage than by anything else. During the past Winter he had had two cases which illustrated this. One was a case of thoracic aneurysm, and the other, of abdominal aneurysm. In the latter instance the patient had been bled three times, and on each occasion the coagulation time of the blood had been greatly shortened. It was usually advisable to draw about fifteen ounces of blood.

Dr. Theisen, in closing, said that before using the serum he always tried to ascertain whether the patient was susceptible to horse emanations. Young subjects did not present this idiosyncrasy as a rule. He agreed with Dr. Reilly that horse serum does not always stop hemorrhage. His use of it was for the prevention of hemorrhage—as a cautionary measure preliminary to operation. It was employed only in cases where the history showed a predisposition to hemorrhage. He also agreed with Dr. Stewart that the published reports about anaphylaxia after diphtheria antitoxin had done much harm. His experience with the use of horse serum had convinced him that it was a most valuable addition to our resources for the control of hemorrhage.

THE MEDICAL TREATMENT OF INTESTINAL STASIS.

BY REYNOLD WEBB WILCOX, M.D., LL.D.,

NEW YORK, N. Y.

Formerly Professor of Medicine, Post-Graduate Medical School and Hospital; Consulting Physician, St. Mark's and Nassau Hospitals.

Every medical generation has a nomenclature peculiar to itself. My grandfather (1819-1856), gave much thought to what was termed a "torpid liver," his son (1849-1906) laid many of his patients' woes to "biliousness," and especially to constipation. They both made use of a pill which was inherited from the former's preceptor, and consisted of two grains of powdered socotrine aloes, the same quantity of powdered gamboge, a grain of calomel, one quarter of a grain of scammony, and one third of a grain of potassium nitrate. Two or three of these pills taken at bedtime produced results; at least, results so apparent that therapeutic nihilism never has been popular, nor has the Christian science movement been recognized in that community. Through two generations at least it has been recognized that systematic poisoning has resulted from the retention in the intestine of excrementitious material. The third generation, in addition to attempts to obviate stasis, has studied the problem of preventing the production of toxic material in the intestine, the first paper having been presented in 1887.

By chronic intestinal stasis is meant that the passage of the contents of the intestinal canal is delayed sufficiently long to result in the production, in the small intestine especially, of an excess of toxic material, and in the absorption into the circulation of a greater quantity of poisonous products than the organs which convert and excrete them, are able to deal with. In consequence, there exist in the circulation materials which produce degenerative changes in every single tissue of the body, and lower its resisting power to invasion by deleterious organisms.

The fundamental cause of intestinal stasis became effective when *homo sapiens* was differentiated from the other primates and assumed the upright posture, entailing upon his descandants all the resulting mechanical disadvantages. This should have been the golden age of surgery for the relief of this condition, but apparently the opportunity was neglected. Then came the inclination to disregard the injunction contained in Genesis iii, xix, and the disposition of man to sit upon his haunches to survey the works of creation, and so men added the effects of sedentary life to those of posture. That this condition of stasis had

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early attracted the attention of scholars, is evident from the *Charaka-Samhita* (A. A. 775) in which six hundred purgatives are enumerated. And, finally, the alleged refinements of civilization, including the artificial feeding of infants, the wide separation of place of production and consumption of foodstuffs, and the abominations arising from cold storage, complete the modern concept of intestinal stasis, and emphasize its pathological sequelæ.

From the standpoint of the physician, the causes which can be remedied by him resolve themselves into four categories:

1. Insufficient peristaltic action of the intestinal wall.

2. Errors in diet.

3. Dryness of the intestinal contents resulting from deficiency in the secretion of the intestinal fluids, especially the bile.

4. Weakness of the muscles of the abdomen, due to overstretching from various causes.

5. Undoubtedly partial stenosis of the bowel caused from within or from without by the pressure of displaced organs, abdominal effusions, peritoneal bands or adhesions which interfere with the normal passage of fecal matter, belong to the surgeon.

The diet should consist of substances which leave behind a considerable undigested residue, to which should be added fruits and green vegetables. Whole wheat or rye bread is preferable to white, while substances which contain tannic acid should be avoided. One of the best additions to the dietary is one to four heaping tablespoonfuls of wheat bran suspended in a glass of cool water after the two principal meals. Agaragar, in half ounce doses, taken morning and night, eaten like a breakfast cereal with milk or cream, is useful, but not to the same extent as bran. This, to be effective, requires, in addition, two grains of the extract of Rhamnus purshiana every second night. In artificially fed infants care should be taken that the protein content be kept as low as is proper, and the fat be administered in sufficient quantities, so that conditions favoring stasis and secondary toxemias in later life may not be produced. Decomposing and fermentable foodstuffs are to be avoided, and generally all cold storage foods, especially poultry and game.

Insufficient peristaltic action must be combated by observing a regular time for evacution, observing any inclination to defecation, and by the use of various "setting up" exercises and, whenever possible, athletic sports. The use of one fiftieth of a grain of physostigmine sulphate, twice daily, which ordinarily is not a cardiac depressant, with the addition of one thirtieth of a grain of strychnine sulphate may sometimes be necessary.

Dryness of the intestinal contents can be obviated by the use of several glasses of water drunk at various times between meals. The habit-

ual use of laxative mineral waters is to be avoided. From time immemorial, oils have been employed, partly for direct laxative results, partly for action upon the bile, and largely for purely mechanical purposes. The oils and fats of animal and vegetable origin were undoubtedly the first to be so employed. In more recent times the mineral oils have been administered solely for their mechanical effects. That petroleum compounds, when given internally, pass unchanged through the intestinal canal, was proved by Randolph and Dixon, in 1885, by Hutchinson, in 1899, and confirmed by Reyburn, in 1901. In recent years the white Russian mineral oil has had considerable vogue as a lubricant, preventing intestinal putrefaction and absorption of toxic products and for softening the intestinal contents, and it is to be found in the pharmacies under various names and in varying quality. The best specimens are of a specific gravity of 0.870 to 0.940, odorless and tasteless, neutral in reaction and nonirritating, do not contain the fluorescent and other lighter hydrocarbons nor sulphur compounds, and are not adulterated with fixed oils or fats of animal or vegetable origin. In practice, the liquid petrolatum (*petrolatum liquidum*) of the Pharmacopœia, which is a mixture of hydrocarbons, chiefly of the methane series, obtained by distilling off most of the lighter and more volatile portions from petroleum, and purifying the residue, is very satisfactory—in that it is effective and one has confidence that the product is constant in composition and of established purity. It is not acted upon by either acid or alkaline digestive fluids and is practically unabsorbable.

When administering liquid petrolatum for considerable periods of time—and it is usually so given—it is well to give five or ten grain doses of calomel about once in seven days, followed by two drams of Rochelle salt in a full glass of artificial vichy the next morning. The amount of the oil given should be one tablespoonful before each meal, or larger doses may be administered once daily, preferably after the evening meal. It is best given cold with cold water with possibly the addition of a little orange juice. In case the liquid petrolatum causes oily movements, which may even be involuntary, the amount should be reduced. It is a matter of experience that after a time a much smaller dose is equally effective. Although I have, for many years, been applying Metchnikoff's theories to practice, I have by no means achieved the success which has rewarded my efforts when directed by the methods mentioned in this paper.

High colonic irrigations at a temperature of 112° F., once or twice weekly, administered by an expert nurse, a gallon of normal saline solution being employed, the rectal tube inserted into the bowel six to eight inches, the bag three feet above the rectum, may be substituted for calomel.

Weakness of the abdominal muscles by overstretching from various causes calls for massage, manual percussion, faradic electricity or the static induced current, whichever is most convenient. As to the various ptoses, it must not be forgotten that they are merely isolated features in the etiology, but just the same they require attention. With proper attention to detail and after careful instruction, various abdominal supporters, the Rose plaster or the Gallant corset, can be readily applied by the physician, with much benefit to the patient. If the ptosis involves several organs, the result is likely to be more satisfactory than after isolated and therefore incomplete operations.

The keynote of Lane's contention is intestinal stasis plus toxemia. He is undoubtedly right in his contention, but whether the toxemia is a direct consequence or an indirect sequence of effects on the nervous system, or on the ductless glands, particularly the adrenals and thyroid, and possibly the pituitary, is not quite so clear. And whether we may go so far as Lane would have us, and attribute to intestinal stasis and the resulting toxemia so many and so diverse end results, which we have hitherto regarded as constituting distinct clinical entities, is not, at the present time, determined. If these radical opinions are finally accepted, a revision of our nomenclature is certainly in order. Clinically, however, the results are undoubted.

Coming now to the mechanical causes of stasis, Jackson's membrane, Lane's kink, Morris's cobwebs, Codman's drag, and the other named obstructions and adhesions, the physician believes these to lie well within the province of the surgeon, and while these structural defects may and do exist without giving rise to symptoms, we must agree that the dictum of Morris in his paper on Peritoneal Adhesions, presented at the last meeting of this society, is sound: "We should reserve the operation (he is speaking of ileosigmoid or ileorectal short circuiting), for those cases in which really good and proper medical resources have been applied for a sufficient length of time without giving a high degree of relief." This statement applies with even greater force to total colectomy.

In the hope that we may employ really good and proper medical resources for a sufficient time, and give a high degree of relief in all cases in which this is possible, this paper has been written.

679 Madison Avenue.

DISCUSSION

Dr. GALLANT said that cobweb obstructions seemed to have got into the heads of the surgeons which made them exaggerate intestinal conditions like Lane's kink, etc.; but if they would read Glennard's book, written in 1885, they would get a clearer idea of these matters. If a person used bran regularly as an article of diet, he would not have any trouble from Lane's kink. If one were to write to the Department of Agriculture for the literature on the subject he would learn a great deal about bran.

For the best results, it was necessary to employ an absolutely clean and pure bran, sterilized on the same principles as the pasteurization of milk—with a temperature high enough to destroy the fungi present, yet not high enough to neutralize the anti-constipation effects. The chief advantages of bran were that it increases the bulk of the faeces, stimulates peristalsis, hastens the exit of deleterious biliary excretions, and thereby prevents resorption—intoxication.

Dr. Reilly said that some persons were averse to taking anything like medicine, and with some families he had got along very well with bran by using it in the form of cookies. There was a breakfast food on the market composed largely of flaxseed and uncrushed cereals which produced the same effect. Its chief value seemed to lie in the flaxseed, and in some cases it acted very nicely.

Dr. Stewart said that the petrolatum liquidum produced in this country was not suitable for internal use. The water-white tasteless product recommended by Sir Arbuthnot Lane for the treatment of intestinal stasis was obtained from Russia. The United States Pharmacopœia permitted the use of fluorescent products of widely varying specific gravity, so that it was important to specify the Russian oil; otherwise the pharmacist would probably supply the Pharmacopœia product, as he was perfectly justified in doing. When liquid petrolatum was given in doses of one-half an ounce or one ounce as frequently prescribed, patients sometimes complained that it leaked through and soiled the clothes. He would be glad to know what experience the members of the Society have had with this product.

Dr. Bishop said there were many sides to the question of intestinal stasis. It seemed to him that in all the discussions on the subject he heard the mechanical factors were brought too much to the foreground; just as if the intestinal tract were an inanimate tube. He would like to emphasize the point that by its peristaltic action the intestine passes over the material in the canal. As to the utility of the x-rays in intestinal stasis, he could not see how they showed anything at all, except the shape of the bismuth mass. What we were dealing with in this condition was not so often a physical obstruction as a matter of motility. In the treatment we should use a suitable dietary, and also something for the relief of spasm caused by harmful proteins.

Dr. Pottenger said that intestinal stasis was one of the things which he had had to contend with more than almost anything else in his advanced tuberculous cases. There were two classes of cases. In the first, which represented Cohnheim's type of spastic constipation, relief might be afforded by withdrawing all purgatives and using a carefully selected diet.

Dr. Morris said that these patients were mostly neurotic. One of the worst cases of asthma imaginable he had cured by short-circuiting the bowel. It was important to bear in mind the physiological psychology of this highly spiritual and constipated type of patient.

Dr. Satterlee said it seemed to him that the x-ray was a very valuable aid. At all events, we could by means of it find out if a patient had enteroptosis. These stasis cases could be divided into two classes: those with enteroptosis, and those without. He did not think a patient could be pronounced completely cured until it had become unnecessary to give any laxative medicine. Lane did not believe that auto-intoxication came from the large intestine; holding that all the trouble is caused by bacilli in the small intestine. Personally, however, he was of the opinion that we might have autointoxication from stasis of the large intestine. Dr. Satterlee then related a case where the patient was unconscious for a year and a half from intestinal intoxication, in which he first used autogenous colon vaccine and afterwards did an ileostomy, with very satisfactory result.

Dr. Wilcox, in closing, said he was familiar with the work of Glennard, whom he had met personally in Paris. Some of the surgeons also had a complete knowledge of his work. They had benefited by it, and as a result had helped out the physician. He had known Metchnikoff for the past fifteen years, having studied at the Pasteur Institute. The use of the *Bacillus bulgaricus* was like sending out an army of troops about which you did not know much against an army about which you knew still less. Still, practically, he had had some good results, chiefly in high livers and chronic alcoholics. As to Dr. Bishop and his theories in regard to proteins, chemically the proteins were the one thing we took in our food which contained sulphur, so that intestinal stasis gave tangible evidence of its existence. However, nitrogen was necessary for life and it was doubtless advisable to select that form of it, whether of vegetable or animal origin, which caused the least disturbance.

DISEASED CONDITIONS OF THE CECUM.*

Etiology, Pathology, and Treatment.

By G. REESE SATTERLEE, M. D.,

NEW YORK, N. Y.

Diseased conditions in the region of the cecum can often be distinctly classified and should be carefully studied before operation, as they are too often considered under the head of what may be a complication or sequela, for instance, appendicitis. The operation of appendicectomy, although necessary, does not cure or even relieve the condition. This is not a new story, as it has been taken up by not a few writers, but it is constantly, at the present time, being ignored by very many of our surgeons and medical men. Reference is first made to the common diseased conditions of the cecum which are the result of three factors, (a) chronic intestinal stasis and (b) congenital conditions, combination of (a) and (b) which usually results in symptoms, and (c) infection. By far the larger number of cases come under this last head.

Special diseased conditions are: 1. Tuberculosis of the cecum, primary or secondary. 2. Amebic colitis, which starts usually in the cecum. 3. Chronic ulcerative colitis, of uncertain origin and where the cecum is especially diseased. 4. Acute inflammatory processes, and secondary to appendicitis. 5. Actinomycosis.

Strictly surgical conditions are: 1. Adhesions and bands. 2. Intussusception. 3. Malignancy.

Of embryological origin are: 1. Diverticula. 2. Microcecum and stenosis. 3. Megacecum and megacolon. 4. As a result of a long, lax mesentery, volvulus. 5. Nonrotated colon. 6. Transposed colon.

THE CECUM.

The cecum, according to Cunningham's *Textbook of Anatomy*,[1] is that "portion of the large gut which lies below the level of" the ileocecal orifice. In shape, a wide, asymmetrical, or looped cul-de-sac, furnished with the tæniæ (ligaments) and sacculations usually found in the large intestine. Its lower end or fundus is directed downward and medially, and usually rests on the right psoas muscle, close to the brim of the pelvis; while the opposite end is directed upward and laterally and is continued into the ascending colon. . . . In length, the distended cecum usually measures about two and one half inches, while its

*For the illustrations in this paper and in the two papers of Dr. Gallant the Society is indebted to the courtesy of the *New York Medical Journal*.

breadth is usually more and averages about three inches. . . . It is usually situated within the right iliac region of the abdomen," but "it is sometimes found high up in the right lumbar region, owing to the persistence of the fetal position." In the majority of instances, it is completely covered by peritoneum and free in the abdominal cavity. In

FIG. 1.—Illustration of Case IV. Marked coloptosis; dilated and ptosed cecum; appendix large and filled with bismuth.

about six or seven per cent., the posterior surface is not covered by peritoneum, but is bound down to the posterior abdominal wall by connective tissue.

EMBRYOLOGY.

In an embryo of 7.5 mm. (Harvard Collection, series 256), there is a slight bend of the intestinal loop toward the vitelline duct, which increases and forms the primary intestinal loop and lies in the yolk stalk. A dilatation of the lower limb of the intestinal loop gives to the processus vermiformis and the cecum and marks the boundary between the small and large intestine. A distinction between the cecum and vermiform appendix in young human embryos is not easily made. Next comes the torsion of the primary loop of intestine. The large intestine first forms part of the posterior half of the intestinal loop and the loop is in the median plane. Then the loop is rotated so that its plane is transverse. The anterior half is on the right and the posterior half on

the left. Further rotation causes the posterior half to become anterior. In a later stage, the torsion is completed by the migration of the cecum to the right side of the body and down toward the pelvis. The vermiform appendix appears in an embryo of 7.75 mm. as an entodermal swelling on the lower side of the caudal limb of the intestinal loop. Later it projects from the upper side of the intestine (embryo fourteen mm., Keibel and Moll[2]). It then later lies on the under surface of the liver. The tæniæ are present at birth (Toldt) and the haustra develop in the first half year, but the cecum does not acquire the characteristic adult form until the third or fourth year. In an embryo of forty-two mm., the bending of the cecum on the colon forms the valves of the colon. In the last fetal months, the relatively large expansion of the cecum compared with that of the ileum, causes the valves to increase in size. In a ninety-five mm. embryo the descent of the cecum toward the pelvis has begun. Complete absence of the cecum and valves has been reported.

When the cecum has a mesentery it is loose and freely movable and has been named *cæcum mobile* or loose typhlon. This is the term used by L. Kast[3] whom I quote. He says the "L. T. (loose typhlon) is situated as a rule in normal position when the patient lies on the back, but easily drops to the level of the brim of the pelvis or into the true pelvis

Fig. 2.—Same case as in Fig. 1. Note the slow progress of the Bismuth meal at forty-seven hours.

in the erect position. . . . The L. T. occurs in all ages in men as well as women. Wandell found it in ten per cent. of 640 post-mortem examinations." "Klose estimates its frequency at ten to twenty per cent." "As a rule, the L. T. is also an enlarged typhlon." "In the majority of cases, the L. T. is complicated by atony and later by inflammation of the mucous membrane." The symptoms, Doctor Kast reports, are similar to those reported in this article. He finds retention of the bismuth meal in the typhlon. Appendicitis, he says, may be differentiated by the high polynuclear leucocyte count, but the signs overlap and are confusing.

Dr. Albert J. Ochsner, in his discussion of Kast's paper, mentioned the functional difficulty which comes from the fact that the cecum is not emptied because it cannot pull against a fixed point, and if we add to this a certain degree of degeneration of the muscular structure, we have a reduction in the working capacity of the organ, which will be so great that frequently it cannot be relieved by the means suggested, from the standpoint of internal treatment, and then the condition must be corrected surgically. This he suggests, either by the fastening of the cecum (Professor Wilms), or by Lane's operation when marked obstruction exists.

MOBILE DILATED CECUM.

The diagnosis of cecal disease and the indications for operation belong to internal medicine, as Boas[4] long ago pointed out. Wilms,[5] in an experience of forty operative cases, called attention to the fact that operations for chronic appendicitis have in many instances failed to relieve the symptoms. He says that the rational treatment for cæcum mobile is fixation. Tischler,[6] in 1909, reported forty-one cases of cecal disease, with comprehensive description of the symptoms from a medical standpoint. Klose,[7] in 1909, reported twelve cases with surgical results. In these twelve cases of dilated and movable cecums, the first seven were discovered only after the abdomen had been opened. After experience with these seven, the last five were diagnosed before operation. Klose made a careful study of his cases by means of the bismuth X-ray test. He says that in cæcum mobile the bismuth remained twenty-four hours in the cecum; and in high degree of atony, thirty-six to seventy-four hours. This has been the experience in my cases, even to a longer period. Weimann,[8] Heile,[9] and Straschenke[10] have also reported cases. Seiler,[11] in an article on Cæcum mobile, gives the symptoms of cecal disease. He says of the atonic condition of cecum, that the organ is felt as a somewhat indistinct, cylindrical, or pear shaped mass, that can be distinctly displaced. It is usually tender, but rigidity and flinching are rarely observed and, if present, suggest inflammatory complication. Gurgling on pressure is characteristic, but splashing rare. In

cæcum mobile, the bismuth remains in the cecum two or three days. Evidence of insufficiency of the ileocecal valve is tympanitic distention of the central parts of the abdomen.

FIG. 3.—Case IV. on the fourth day of the bismuth meal. Cecum has less bismuth, but the appendix is still filled.

Blake[12] describes a patient who had pain in the right lower quadrant, occurring in ill defined attacks, always associated with the production of gas and evidences of intestinal autointoxication. Distention of the cecum was shown by tympany, splashing, and ballooning. Plication of a dilated, atonic cecum resulted in complete recovery. Blake remarks that the chief characteristic of this cecum is not its mobility, but rather its size, and that the symptoms are to be explained on the hypothesis of atonic dilatation rather than on that of mechanical obstruction. As to the cause, it is frequently associated with general enteroptosis, with developmental errors as chief factors. His theory of operation is that the symptoms are caused and the condition is perpetuated by enlargement of the cecum. This leads to stasis and fermentation and the production of gas, which, in turn, by overdistention, increases the atony and inability of the cecum to empty itself. He reports excellent results in seven or eight cases, with freedom from gas or pains. Postoperative radiographs show normal cecums. Blake does not believe that mobility of the cecum has anything to do with the symptoms.

It is the writer's plan to present a few case histories, each one illustrative of a separate type of cecal disease, and to discuss in a general way their treatment. The seventh and four last cases are contributed by Dr. J. M. Lynch, of New York, to whom the author is much indebted for advice in this study. Dr. Albert G. Bennett, of Greenwich, Conn., has been of material aid in the bacterial study and in the preparation of the autogenous vaccines used in treatment and has contributed his method of obtaining the vaccines. Dr. L. T. LeWald, of New York, has made most of the radiographs.

Case I. Mrs. H. B. V., aged forty-two years, had been constipated for ten years following an operation for polypus of the rectum, Alexander's operation, and amputation of the cervix. Before the operation, had pain in the right side of the abdomen,

Fig. 4.—Case IV on the sixth day of the bismuth meal. Residue in the appendix and marked sluggishness in transverse colon. Appendicectomy was necessary a few months later.

constipation gradually becoming worse, with mucus in stools, headaches, neuralgia, nausea, heaviness, and malaise. Hemorrhoids which bled profusely occasionally. Had lost eight pounds in six months. Chief complaint, pain in right iliac region, "a lame side" as she called it, heaviness, and weakness. Enemata and cathartics were beginning to lose their effect. Her mother had a similar condition. Patient looked "toxic" and had a sour odor of the breath. Abdomen lax, colon hard and doughy, and cecum and transverse colon contained hard scybala. The stomach percussed large and low and there was tenderness over the cecum. Radiographs showed a long stomach with

a slight residue at six hours. The colon was very long and markedly ptosed. The cecum was very much ptosed, well in the pelvis, and was not empty at 71 hours. The descending colon and sigmoid were very sluggish, not empty at 71 hours. There was some ileac stasis. Diagnosis: Ptosed, dilated, and sluggish cecum and sluggish ptosed colon.

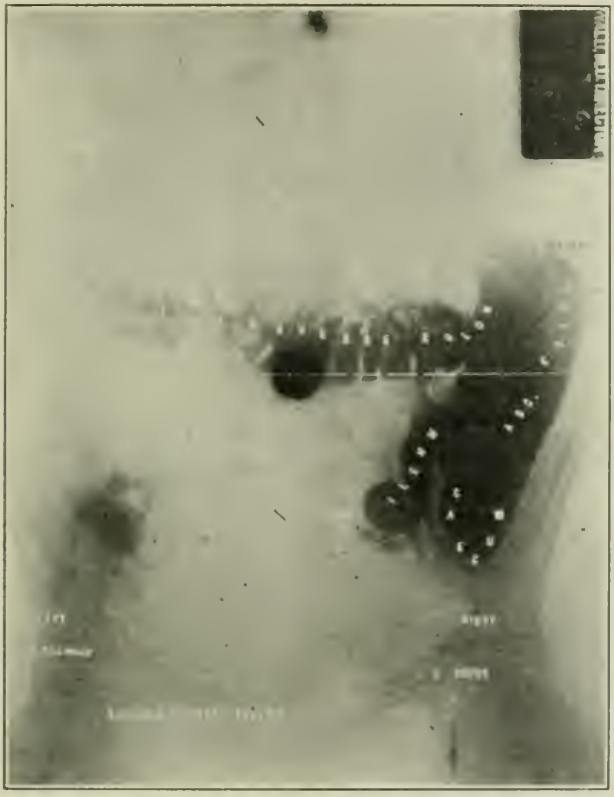

FIG. 5.—Illustrative of Case v. Five hours after bismuth meal. Appendix, long, kinked and filled with bismuth; bismuth massed in cecum and ascending colon.

The treatment in this case has been abdominal support, elevation of the foot of the bed, Russian oil, diet and hygiene for constipation. One month after, because of inefficient treatment, the condition was about the same. Massage of cecum and colon, agaragar, elevation of foot of bed and autogenous vaccines will be pushed strenuously before operation is resorted to.

CASE II. Mr. J. W. C., aged fifty-six years, gouty symptoms and gouty joints; constipated, with pain and dragging sensation in the abdomen. Had had a few "bilious attacks" with nausea, some pain in the region of the liver, and slight jaundice. Suffered now with vertigo and nausea after eating, flatulence, and eructations. Somewhat emaciated, skin sallow, marked tenderness over the cecum, and gurgling in the small intestine. The urine contained a trace of albumin and much indican. The stool showed a moderate amount of vegetable material and considerable gas and indol pro-

duction. The x-ray showed a marked gastrocoloptosis with water trap stomach. The stomach was slow in emptying and the cecum was markedly ptosed, dilated, and had a large residue of bismuth.

An abdominal support was ordered, colon irrigations, and a laxative diet. Later sodium phosphate and abdominal massage with the idea of emptying the cecum and stimulating the peristalsis, and Russian oil were given. The results, five months after, have been very good, the bowels acting well and the tenderness over the cecum having disappeared.

Case III. Miss B. R., aged thirty-six years, eight years ago had a right nephropexy; at the time of the operation the appendix appeared normal, but no note was made about the condition of the cecum. Since the operation has had constipation and "indigestion;" for years no normal movement. Three weeks before examination had pain, soreness, and ballooning in the right iliac region with flatulence and inability to sleep. Examination showed a narrow waist and broad pelvis and marked tenderness over the region of the cecum, but no rigidity. The ascending colon was full of fecal masses. Radiographs showed a slight water trap stomach, which was slow in emptying; a rapidly emptying small intestine, and a very sluggish and much ptosed colon. *The cecum was markedly ptosed and sluggish.*

The treatment has been hygiene and diet for constipation, elevation of the foot of the bed, abdominal support (which was not applied until later), and Russian oil and agaragar. Autogenous colon vaccine isolated from the stool, gave almost immediate relief, so that in about a month's time all the pain, tenderness, soreness, and swelling had disappeared, and three months after the first observation, the abdomen was apparently normal. The bowels have become regular, and with the exception of an occasional attack of gastritis, the patient is well. As no distinct signs of appendicitis were noted, the operation was averted.

The following two cases show dilated atonic cecums with probable anastalsis developing into appendicitis and appendicectomy.

Case IV. Miss D. D., aged twenty-six years, had been constipated from childhood when she was in the habit of taking cascara. For ten years she had a "sour stomach" and had taken magnesia frequently, lately without effect; had had flatulence and headache, but a good appetite. Four years ago, after injury to spine, after a fall from a horse, wore a plaster jacket which did not help the constipation. Had had soreness in the right iliac region, but no pain and lost some weight. Examination showed a marked degree of toxemia, tenderness, and some degree of rigidity over the cecum and ascending colon and indicanuria. Radiographs showed a dilated, ptosed semi-lunar stomach, emptying in five hours; a very long markedly ptosed colon, not empty in six days. Cecum ptosed and dilated. Appendix, large, overhanging brim of pelvis and contained bismuth for five days. Gastric contents normal. (Figs. 1 to 4.)

The treatment for six months was medical, chiefly diet and hygiene for constipation, abdominal support, massage and vibration to the colon, with particular attention to the cecum and ascending colon. Results were ineffectual, cathartics being resorted to frequently. Patient then passed out of control and was operated upon for appendicitis a few months later. At the present time she is reported as improved.

Case V. Miss M. McD., aged twenty-seven years, colored, for years had been very constipated. The history, two years ago, showed that she had been worse for the past two years, with "nervous indigestion" and frequent attacks of vomiting, flatulence, vertigo, and cramplike pains in abdomen after eating. Lost seventeen pounds in six months and was markedly emaciated. She first presented herself with severe external, nonreducible, inflamed hemorrhoids. The abdomen was very tender, especially over the cecum, and fecal masses in the colon were easily palpable. Hemor-

Fig. 6.—Case v at nine hours after bismuth meal. Marked coloptosis. Note the change in position of the colon from that at five hours, demonstrating the mobility of that organ.

rhoidectomy. Radiographs then showed a normal stomach, but a very long and extremely sluggish colon, not empty after six days. The cecum was very large, residual, and showed a reversal of the bismuth meal in serial plates. Appendix well outlined, bent on itself, and overhanging the pelvic brim, contained bismuth four days after the colon had emptied. There was very marked dilation of the sigmoid flexure with marked stasis. (Figs 5, 6, and 7.)

An acute attack of appendicitis made appendicectomy necessary, and at the same operation the transverse colon was sutured through its mesentery to the abdominal wall, above the level of the umbilicus. The radiographic findings were corroborated at operation.

Case VI. Miss L. DeM., aged thirty-one years; one summer, in Baltimore, at the age of eighteen years had a severe attack of dysentery, gradually lost strength, had weak eyes, and acute pains in the right side of abdomen; probable that constipation started at this time. Five years ago was operated on and a gangrenous appendix found. The wall of the cecum was reported to be thickened and a part of it was removed. Microscopical examination showed no evidence of tuberculosis nor of Amœba histolytica. She had had, previous to the operation, severe rectal hemorrhages,

Fig. 7.—Case v at twenty-six hours. Very little progress of the bismuth meal; appendix well filled with bismuth and remained so for over a hundred hours; appendicectomy.

which continued after operation, but not so severely. The pain was much improved, but a colitis has continued ever since with blood, pus, and mucus in the stool. Proctoscopic examination revealed no ulceration of the rectum or lower sigmoid. The loss of weight at the time of operation was great, but she gained twenty-one pounds in a sanitarium. Colon irrigations have been constantly employed, medicated and plain salines, but the latter had agreed best. She first came under my care in February, 1913. Radiographs showed a normal stomach, the cecum and colon ptosed, but very active and irregular with retention in the cecum. The bismuth reached the rectum in five and one-half hours. Repeated examinations of the stools showed the same picture, blood, pus, and bacteria, watery with mucus and no parasites nor tubercle bacilli. Diagnosis, ulcerative colitis with marked involvement of the cecum.

The treatment has been abdominal support, colon irrigations of normal salt solution, and bismuth as little as possible, to control the diarrhea. Autogenous colon vaccines produced marked improvement for about ten months and then were given up on account of their toxicity. Since then, improvement has been very slight and colostomy was advised by not accepted. Diet has had no effect, but colon irrigations are a necessity.

FIG. 8.—Illustrative of Case IX. Nonrotation of stomach and colon, an embryological defect. Whole of the colon in right half of abdomen. Duodenum and jejenum in the right half.

CASE VII. J. L., male, aged twenty-four years, single, as a child, was delicate and had "indigestion." Hernia at ten years. At no time gave any physical signs nor symptoms pointing toward tuberculosis, except diarrhea. Five years previously had a "cold," and severe diarrhea, eight to ten movements during the day, and eight to ten at night with cramps around the umbilicus. The diarrhea continued, the loose movements first and then cramps; the condition was better during the summer. For four years was well and then diarrhea and cramps again, attributed to a "cold." Heartburn for one-half to three quarters of an hour after meals, relieved by opium and hot water bags.

Operation showed a cecum studded with miliary tubercles and the caput coli and appendix were fully one inch thick, the base of the appen-

dix thickened and looking like a granulating finger. The ascending colon was normal. The cecum, appendix, and a portion of the ascending colon and ileum were resected and an anastomosis was made between the ileum and transverse colon. The patient died three weeks after operation, from an abscess of one of the stumps which had ruptured into the peritoneum. Death was from sepsis, and an autopsy revealed no other evidence of tuberculosis. Microscopical section showed typical miliary tubercles, but no tubercle bacilli. This was, therefore, a primary tuberculosis of the cecum.

Case VIII. Mrs. C. S., aged thirty-five years, no history of intestinal trouble in the family. At the age of fifteen years fell, sustaining an injury to the spine, from which she apparently fully recovered. Had had two children and an ectopic gestation three years ago, when she had a laparotomy. She had always had a "stomach ache" at the time of menstruation. Between the ages of eighteen and twenty-two years, patient was very stout, but lost it all since then. For seven years had had pain resembling that of gallstones with flatulence and eructations. Constipation progressive, with headache and backache, no jaundice. Three years ago, operation for extrauterine gestation. Patient was invalided, with pain in abdomen, flatulence, and backache. Examination showed a somewhat emaciated woman with sallow complexion and acne. Soft abdomen with point of tenderness in the region of the gallbladder. Peristaltic waves over region of stomach and cecum could be plainly seen. Radiographs showed a water trap stomach with some spasm of the pylorous and a dilatation of the first portion of the duodenum. Six hour gastric residue. No gallstones evident.

The colon was markedly ptosed, the mid portion being drawn down at an acute angle into the pelvis, as if fixed by adhesion; this was proved at operation. The cecum was dilated and ptosed and showed marked stasis during the course of the test meal and after a bismuth enema, appearing as if a constricting band across the ascending colon was the cause. This also proved at operation. The probable diagnosis of gallstones, water trap stomach, and duodenal adhesions, adhesions of ascending and transverse colon, was shown at operation and, besides, a chronic appendicitis and Jackson's membrane. The adhesions were cut, the appendix was removed, numerous gallstones were found and removed with the gallbladder which had a diverticulum, and a Coffey suspension of the colon and stomach was done. Four months after, symptoms disappeared and the patient is making rapid progress toward health.

Case IX. Mr. T. O. A., aged fifty years; father had "dyspepsia." Had been a vigorous eater all his life, especially of meat. Alcohol, moderate; tobacco, none since boyhood. Had had attacks of migraine which were improving. Bowels regular. The attacks of sick headache were always preceded by marked flatulence. February 15, 1912, had a severe attack of nausea and vomiting of blood, with pain in the right upper quadrant of abdomen. At that time he was in a San Francisco hospital, and as the gastric contents showed absence of free hydrochloric acid, a possible diagnosis of gastric carcinoma was made and the patient sent to New York for further study. After being placed on a milk diet and being very nervous and anxious about his condition he lost twenty-four pounds. When first seen patient complained of nausea and a gnawing pain and distress in epigastrium. Examination of abdomen was negative.

Analysis of gastric contents showed absence of free hydrochloric acid and traces of lactic acid. Feces were normal. Previous to this examination one radiologist after taking thirty plates of the stomach had given the opinion of a pyloric lesion and advised operation. Our radiographs showed a normal stomach aside from slight retention, but the duodenum and jejenum were entirely on the right of the median line. The cecum was in the median line and close to the pylorus and the remainder of the colon entirely to the left of the median line (Fig. 8.) This is evidently a *case of*

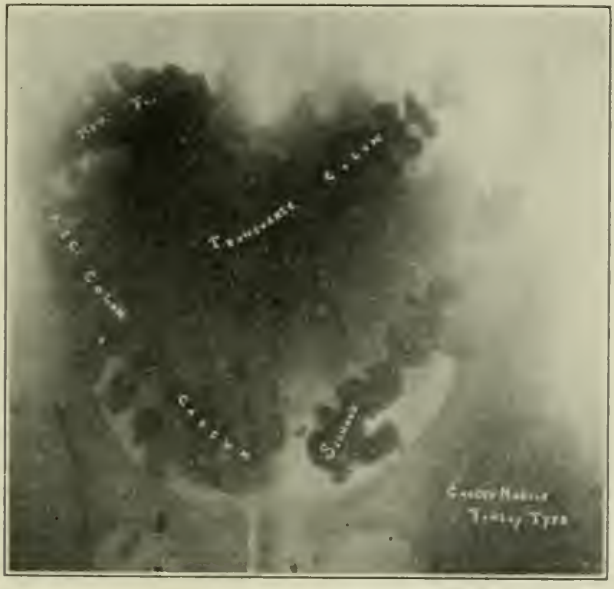

FIG. 9.—Illustrative of an embryological and congenital defect, a misplaced dilated cecum. This was found as a similar condition in two brothers. (LeWald.)

nonrotation of the stomach and colon, the cecum having failed to migrate to its proper position. In one of the series, a loop of the colon appeared in the right quadrant showing the possibility of a long lax colon mesentery and a volvulus formation. The impending strain of uncertainty and possible operation being over, the patient improved markedly and did well, wearing an abdominal support with the idea of keeping the colon in place.

CASE X. Miss E. A., aged fifty-three years, was a "seven months' baby." At the age of twenty years was in a runaway accident and thrown on abdomen. Some time later, when suffering from constipation, was told in Paris that she had a "stricture of the lower bowel" and had long bougies passed up the rectum, supposedly with the idea of dilating the stricture. She was said to have had gallstone attacks two and a half years ago. Had been at Carlsbad and other watering places for this and neuralgia. She had always been a good eater and enjoyed cocktails. Three weeks before examination, she had pain in the left side of abdomen, intermittent, and "soreness" in abdomen. The bowels had been very regular. Chief complaints were distress on eating and nervousness. Examination showed a very nervous woman, abdomen tender all over. The stomach percussed large, but the abdomen was soft and apparently normal. Radiographs showed a dilated stomach, emptying within the normal limits. The whole colon was very small and thin, the cecum was very small, ptosed, and

showed a slight residue. In forty-four hours the colon, with the exception of the cecum and sigmoid was empty. These parts showed slight retention of the bismuth meal. Practically the only treatment was stomach lavage, which removed large quantities of mucus. There was no evidence of interference with the function of the colon and one and a half year after, the patient was in good health.

Case XI. Mr. E. S., aged thirty-six years, when seen in April, 1911, had had dull pain in the epigastrium and to the left; cramps in abdomen and nausea. Said that bowels moved regularly. Colon and stomach lavage relieved, but did not cure. Examination showed some emaciation and tenderness and slight rigidity in left inguinal region. Temperature was 99.4° F., Pulse 78. Examination of the chest showed the heart on the right side, the apex to the right, confirmed by radiographs. Radiographs of the stomach showed the organ entirely on the right side of the body, the pylorus to the left. The organ was normal and active, the whole colon markedly ptosed, the cecum to the left and well in the pelvis; ascending colon on the left; cecum and ascending colon sluggish. The stools showed large quantities of mucus. Gastric contents normal. In this case there were the signs of appendicitis, with point of tenderness and rigidity over McBurney's point, only on the left side. A marker on this point appeared in the radiographs to be over the hepatic flexure. Diagnosis made of chronic colitis with complete transposition of the viscera. The subsequent course of the trouble confirmed the diagnosis for a while, but unfortunately the patient disappeared.

Case XII. Mrs. J. E. T., aged forty years, school teacher, for fifteen years had diarrhea with "dyspepsia" and nausea, but no vomiting; more or less colitis with severe colicky pain followed by desire to move the bowels. The pains were cramplike, in the right iliac fossa, radiating to the umbilicus and continued after the bowels had moved. Movements, ten to fifteen in twenty-four hours and contained occasionally blood and mucus. Patient was of the enteroptotic type and had tenderness in the right iliac fossa.

The patient was operated upon by Doctor Lynch for chronic appendicitis. There was a long appendix, showing catarrhal changes. The base was a funnel shaped opening, which was all that constituted the cecum and communicated with the colon. Complete recovery followed. There was a rudimentary cecum, the result of faulty development.

Case XIII. A case of megacecum, an accidental discovery. The patient was operated on for carcinoma of the rectum, which was successfully removed. The cecum was found to be four inches long and very much dilated. The organ was doubled up on itself and closely approximated the sigmoid flexure. Good recovery followed the operation.

Case XIV. Y., school boy, aged twelve years, diverticulum of the cecum. Previous history up to May, 1913, was good. On May 9th, had severe pain in the right iliac fossa. As he returned from school, a physician found some pain and rigidity in this region. The following week there was more or less pain and high temperature between normal and 100° F. Constipation with occasional vomiting; at no time during the week free from symptoms. The stools were blood streaked. Admitted to the hospital, May 16th, with severe paroxysmal pain and more or less rigidity in the right iliac region, extending over the course of the ascending colon.

May 18th, the pain and rigidity were so severe that laparotomy for intestinal obstruction was performed. A large diverticulum on the outer side of the cecum was found, into which the end of the ileum and three quarters of the appendix had been sucked up, causing obstruction. This

could not be reduced, and was resected with part of the ascending colon, but the operation was too late and the patient died one hour later.

Case XV. F. M., male, aged nineteen years, had been well up to one morning when he had crampy pains in abdomen at breakfast. The pains became worse during the day, and he had to return from business at 4 p. m. He ate a hearty supper at seven and retired at eleven o'clock. Was in bed a short time, when the cramps became very severe with evidences of shock. The pains were all in the left iliac fossa. Vomited three times and had no relief from morphine. Castor oil and salts were vomited. At six o'clock the next morning, the pain diminished and he was more comfortable. Next day, colicky pains but not so severe. Doctor Lynch saw him at 7 p. m. The abdomen was soft, pain and tenderness in the left iliac fossa; temperature, pulse, and respiration normal. Rectal examination showed nothing, except ballooning; saline per rectum resulted in gas and some fecal matter. Proctoscope revealed nothing. Sent to hospital. At 12, temperature 101° F., pulse 107, respiration 30. Pain now in right side of abdomen and at McBurney's point. A mass was palpated in this region.

Dr. J. M. Lynch opened the peritoneum, which was dark and congested; large quantities of muddy fluid poured out. The bowel was enormously distended and covered with plastic lymph. The finger followed the bowel to the liver, where the cecum and appendix were adherent to the liver by plastic exudate. Cecum and colon were pulled out through wound, and the mesentery was found to be nonfused and very long. Diagnosis: volvulus of the cecum and ascending colon. An incision into cecum was made and a large quantity of foul smelling contents removed. After warm applications, the color of the cecum gradually returned and the gut was replaced in the abdominal cavity. Recovery followed, and later an ileosigmoidostomy for drainage was done with success. Four years after the patient was in good condition.

SUMMARY OF CASES.

Case I. Ptosed and dilated residual cecum and a long sluggish colon, excessively long sigmoid; intestinal stasis. Medical treatment: Abdominal support, position, diet and hygiene for constipation, Russian oil; autogenous colon vaccines, latter very successful. Just beginning to have patient under control.

Case II. Woman, aged fifty-six years. Gouty symptoms and gouty joints. Water trap stomach of slow emptying time, dilated, residual cecum, ptosis, and intestinal stasis. Treatment: Abdominal support, modified diet, sodium phosphate, and Russian oil; massage of colon; care of teeth and treatment of pyorrhea alveolaris with autogenous vaccines. Results after seven months, good

Case III. Woman, aged thirty-six years. Enteroptotic; tender, ptosed, dilated, and very slow cecum; intestinal stasis. Treatment: Abdominal support, position, diet and hygiene for constipation, Russian oil, massage and vibration. Autogenous colon vaccines cleared up the pain and tenderness over cecum. Results, excellent at first, relapse.

Case IV. Woman, aged twenty-six years. Constipated from childhood, had cathartic habit; ten years sour stomach, had taken magnesia frequently, lately without effect; flatulence and headache. Soreness in the right iliac region, no pain. Marked degree of toxemia, tenderness, and some rigidity over the cecum and ascend-

ing colon. Radiographs showed a dilated stomach, slow in emptying; very long, markedly ptosed colon and cecum. Cecum ptosed and dilated, not empty in six days. Appendix well marked overhanging pelvic brim and retained bismuth for five days. Treatment: Unsatisfactory; appendicectomy six months later. (Figs. 1, 2, 3, and 4.)

Case V. Colored woman, aged twenty-seven years. Long history of constipation with severe hemorrhoids on first examination, three years ago. Hemorrhoidectomy. Extreme intestinal stasis, severe symptoms. Stomach normal; colon very long, markedly ptosed; colon very slow, not empty after five days. Dilated, residual cecum; appendix full of bismuth for four days. Excessive dilatation of the sigmoid. Apparent anastalsis of ascending colon, followed by appendicitis and appendicectomy. Colopexy at same operation. Slow improvement, but frequent colon irrigation necessary on account of an enormously dilated sigmoid flexure. Careful dieting and hygiene. (Figs. 5, 6, and 7.)

Case VI. Woman, aged thirty-one years. Thirteen years ago, attack of dysentery. Seven years ago, appendicectomy for gangrenous appendicitis; cecum and ascending colon badly ulcerated. Tuberculosis and amebic colitis ruled out. Colon irrigations ever since. Marked improvement for eight months under treatment with colon autogenous vaccines, and very little other medication. Bismuth meal passed through intestine very rapidly, but some retention in the cecum. Stools now from five to ten a day, water, blood, pus, and bacteria. Declined to have an ileostomy or colostomy, the only real help for this condition.

Case VII. Man, aged twenty-four years. For five years, diarrhea and cramps. Operation showed marked miliary tuberculosis of caput coli and appendix. Resection, followed by death from sepsis, three weeks after. Post-mortem findings negative for tuberculosis in any other part of the body. Diagnosis, primary miliary tuberculosis of the cecum.

Case VIII. Woman, aged thirty-five years. Three years previous, laparotomy for ectopic gestation. For seven years symptoms of gallstones. Marked flatulence and backache, loss of weight steady. Diagnosis of gallstones, water trap stomach, adhesions of transverse colon; dilated, ptosed cecum with residue caused by adhesions, all verified at operation with a chronic appendicitis in addition. Removal of gallstones with excision of gallbladder, appendicectomy, cutting of adhesions, and Coffey's hammock operation with good results.

Case IX. Man, aged fifty years. Chronic gastritis with achylia, mistaken for gastric carcinoma. Radiographs showed nonrotation of stomach and intestine, the stomach and colon situated to the left of the median line. Volvulus formation in one of the plates. Treatment: Abdominal support. (Fig. 8.)

Case X. Woman, aged fifty-three years. Chronic gastritis and supposed stricture of the lower bowel. Radiographs showed dilated stomach, microcecum, and microcolon. Treatment, lavage and diet. Good results one and a half years after.

Case XI. Man, aged thirty-six years. Dull pain in epigastrium and to the left; cramps in abdomen and nausea. Colon irrigations with slight improvement. Complete transposition of all the viscera, thoracic, and abdominal. Cecum ptosed and sluggish; stools contained large quantities of mucus. Diagnosis, transposition of viscera, chronic colitis, ptosed, sluggish cecum. Tender spot over McBurney's point on the left corresponded to the hepatic flexure of the colon.

Case XII. Woman, aged forty years. Fifteen years' "dyspepsia," nausea and diarrhea. Cramplike colicky pain in right iliac fossa, radiating to umbilicus; blood and mucus frequent in stools. Enteroptotic type. Operation showed catarrhal appendicitis with a funnel shaped opening into ascending colon. Rudimentary cecum, the result of faulty development.

Case XIII. Megacecum, discovered accidentally at operation. A case of carci-

noma of the rectum. Cecum was four inches long and much dilated. Recovery from operation.

Case XIV. School boy, aged twelve years. One week, symptoms resembling appendicitis and intestinal obstruction. Operation showed a large diverticulum on the outer side of the cecum, into which the end of the ileum and three-quarters of the appendix had been sucked up, causing obstruction. Resection, for the patient was in extremis and died.

Case XV. Man, aged nineteen years. Well up to one morning, when he was suddenly seized with crampy pains in abdomen and shock. Symptoms of intestinal obstruction, pains, and tenderness in left iliac region. Operation showed enormously distended cecum and ascending colon with very long, nonfused mesentery. The dark color of gut returned to normal and the gut was replaced. Recovery, and later ileosigmoidostomy. Four years later, in good condition.

DIAGNOSIS.

Many cases of dilated, residual cecum and intestinal stasis give symptoms resembling ulcer or adhesions of the duodenum, ulcer of the stomach, pyloric stenosis, and gallstones. The cecum has aptly been called the "second stomach," the close connection between the two organs being explained by their intimate relationship through the sympathetic nervous system. Pain from lesions in the region of the cecum is often referred to the stomach, and vice versa. This close relationship is illustrated by the frequency of stasis in the stomach with dilated residual cecum, without any actual stomach, duodenal, or gallbladder lesion.

Close attention in these cases will often show the typical symptoms of cecal disease, a ballooned, tender cecum with thickened walls and signs of intestinal stasis. It is rare, I think, to find this condition complicated by ulcer of the stomach or duodenum. Ulcer of the duodenum can often be diagnosed by careful examination of the duodenal contents, by means of the duodenal catheter and the X-ray with and without the duodenal tube, and the persistent local pain, tenderness, and occult blood in the stool following forty-eight hours of meat free diet. A thorough X-ray examination of the whole gastrointestinal tract is necessary in every case, and the habit of studying only the upper half of the abdomen when the symptoms and local signs point here, should be discontinued. Gallstones are perhaps the most difficult thing to prove and are often diagnosed only at operation.

Radiographs with bismuth injection of the colon should be employed in every instance to prove apparent lesions in the cecum or colon. This is an excellent way to corroborate cecal stasis. Chronic appendicitis is often present, the symptoms being overshadowed by the intensity of the other lesions. Constant soreness and tenderness over a large area to the right, with persistent constipation, indicates rather cecal disease than appendicitis, which gives usually a history of distinct attacks of

pain, nausea, and vomiting. Symptoms of intestinal obstruction in this region point to adhesions or Lane's kink, intussusception, or volvulus, which can sometimes be differentiated by the X-ray, but otherwise only at operation.

TREATMENT.

The medical treatment of the dilated, ptosed, and sluggish cecum consists in relief of the ptosis by means of properly fitting abdominal supports, elevation of the foot of the bed up to point of tolerance, massage and vibration with the object of increasing peristalsis and emptying this organ and the colon; diet and hygiene for constipation, occasional colon irrigations and castor oil. Russian mineral oil taken regularly has given excellent results. Autogenous colon vaccine, made from cultures from the patient's stool, will relieve the autotoxemia and sometimes move the bowels. Water *ad libitum* is commended.

Surgical operations that can be used are suspension of the transverse colon, which elevates the cecum; in conditions leading apparently to obstruction, short circuiting, colostomy, ileostomy, or partial colectomy are indicated. Partial colectomy is the operation of the author's choice. Plication of the cecum has been practised successfully by others and in a few cases unsuccessfully; and the sigmoid is occasionally suspended. The important thing is to do a thorough operation and to leave no cause for hernia or obstruction. Diverticula, malignant and tuberculous processes, should, of course, be removed.

Autogenous colon vaccines, in the author's hands, have given much relief to the autointoxication. The autogenous vaccines used in these cases were made by Dr. A. G. Bennett in the following manner: A portion of the stool was broken in a small quantity of saline and streaked out on lactose litmus agar. This was incubated for from twelve to eighteen hours, and several of the red colonlike colonies were fished therefrom and transplanted on plain agar. This was again incubated for eighteen hours, washed with normal saline, and heated to 60° C., in order to kill; then trial cultures were made in order to insure sterility. This emulsion was standardized and diluted in appropriate doses and 0.25 per cent. carbolic acid was added as a preservative.

With reference to the complement fixation work, Doctor Bennett examined the blood in several cases prior to fixation treatment, and was unable to find in any case antibodies for the colon bacillus by the complement fixation method. It might be argued, theoretically, that the absence of these antibodies would rule out a colon infection, but when we consider that there are localized infections, notably gonorrhea, which do not show antibodies in the blood, these cases may possibly be likewise of a low grade type with a corresponding absence of antibody forma-

tion. The patient's symptoms are mainly due to toxemia which, of course, could not be registered by this method. The effects last for four days to two weeks and are of much aid in operative as well as in inoperative cases.

Milk fermented by lactic acid bacilli, is also of much aid in this direction. Colon irrigations with normal saline and ichthyol solutions are often very useful.

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125 West Fifty-eighth Street.

DISCUSSION.

Dr. Oliver T. Osborne, New Haven, Conn., said that among the students at Yale he saw a very large number of patients in the early stages of appendicitis or inflammation in that region, and that these cases were constantly on the increase. He had wondered whether they were due to athletics or to conditions incident to the students being obliged to be in chapel every morning at 8:10. Their hasty breakfasts (usually largely of oat-meal, taken with sugar and cream or milk) and then the rush to chapel and recitation generally allowed no time to go to stool till later in the day. Under the circumstances constipation soon developed, and this was no doubt the cause of many of the attacks he had observed. That sort of thing we knew, of course, was bad, and now-a-days young people of both sexes frequently contracted indigestion.

Dr. Ernest Zueblin, Baltimore, described a case (patient 35 years old) T. T. in which the x-rays showed, 1 hour after intake of second bismuth meal, stomach below umbilicus; first bismuth meal, given 18 hours previous, was recognized in ascending colon and dilated caecum; hepatic flexure low, with acute angulation of transverse colon; steep ascent of transverse colon towards splenic flexure. Small intestine plunged deeply into lesser pelvis. One hour later, stomach empty, fairly emptied; most of the bismuth in the small intestine, part of the meal in caecum and ascending colon; slight shadow noticed in transverse colon. Four hours later (22 hours after

first meal) stomach empty, most of the bismuth found in the shortened and dilated caecum and ascending colon; part of it had entered into the low transverse colon; 48 hours later the same picture as mentioned above was noticed, hardly any progress of the intestinal contents to be found. Clinically the patient complaining of localized pain in ascending colon and caecum; on palpation and percussion the caecum was found dilated and tender. Tenderness of appendix over psoasiliac muscle (Ostraczow's method); the patient presented, with an involvement of both apices, a marked constitutional focal and local reaction after being given .0005 grm. tuberculin. The patient being operated upon, a kinked long retrocaecal appendix was found imbedded in adhesions. Of the stricture suspected from the x-ray plates nothing could be seen. Peritoneal surface of the caecum and of the ascending and transverse colon was glistening, no signs of muscular hypertrophy nor adhesions could be found. The speaker said he had cited this case to illustrate how extremely careful we should be in our interpretation of x-ray findings. The condition present might be simply a functional spasm. In chronic constipation simple medical treatment was often not sufficient, and he had found that vaccines might be of great service.

Dr. W. Wayne Babcock, Philadelphia, said it was a fact that certain of these cases which were not relieved by support or internal treatment were favorably influenced by the use of vaccines. Some of our patients of neurotic type reacted violently from tuberculin, and after being placed upon tuberculin treatment showed surprising improvement. One wondered if the treatment advocated by Weir Mitchell years ago for neurasthenia, which embodied chiefly the rest, forced feeding, and graduated exercise now found so useful in tuberculosis, did not owe at least a part of its efficiency to the fact that it had been used in many cases for occult forms of tuberculosis. Again, certain patients who developed evidence of colonic disease after typhoid fever or acute intestinal infection improved under the case of typhoid or colon bacteria. It had been recognized by surgeons for a number of years that many cases of chronic colitis characterized by diarrhea were cured by the simple removal of the appendix. We were now beginning to suspect that not a small number of the cases of intestinal indigestion result from chronic infection of the gall-bladder. While these patients might improve after removal of the colon because the absorptive area of bowel was reduced, it was not unlikely that they might be cured by the simple removal of the gall-bladder. The colon had been made a sort of "scape goat" for intra-abdominal affections not clearly understood, just as for many years the stomach was blamed when it reflected symptomatically the disease of other intra-abdominal organs. It was evident that many of the operations now being done on the colon were makeshift measures which would be discarded as our knowledge of the subject increased. The mechanical effect of the ptosis of the colon or other intra-abdominal organs was often the least important of the conditions to be remedied.

Dr. Woodruff said that this paper showed still further the wonderful work of vaccines. At the same time, we should not neglect to consider the cases in which they did harm. Recently he had had a talk with Wright on this subject. By their action the bacilli caused to be formed certain bodies which did good things and bad things also. During the past two years his attention had been drawn to quite a number of cases of tuberculosis following antityphoid vaccination. The vaccine, in these cases, acted like tuberculin, and brought out tuberculosis at a particular focus. He had made up his mind that in about one case in a hundred a concealed tuberculous focus was lighted up by the vaccine, and Vincent, of Paris, had come to the same conclusion. Chantemesse had confirmed the observation that tuberculosis might ensue, and warned particularly against using the vaccine where tuberculosis was suspected. These cases were still under discussion. Some of the cases where serious results had fol-

lowed antityphoid vaccination were of great interest. In one instance fatal pneumonia developed, and both lungs were found riddled with abscesses. In another case also, in which the diagnosis lay between typhoid fever and tuberculosis, the autopsy revealed abscesses in both lungs. He therefore thought that a vaccine would do exactly what the living bacilli would, and, consequently, if an individual was not strong we should proceed very cautiously in the matter of vaccination. If there was any affection in the course of which tuberculosis might be expected to develop it was diabetes; yet Prendergast, of Brooklyn, had administered antityphoid vaccine to three diabetics, with the idea of reducing the sugar in the urine. In one of the cases tubercle bacilli appeared in the sputum after the treatment had been discontinued, and another during treatment; this patient dying on the ninth day after the last dose. The case might also be mentioned of the member of the New York State National Guard who, although suffering from organic heart trouble, had been given antityphoid vaccine and died a few weeks later from ulcerative endocarditis which evidently began shortly after the vaccination. The speaker said he did not wish, however, to throw a damper on the practice of vaccination. It had accomplished wonderful results, and he himself was advising it in suitable cases. In his own person, when he was suffering from general furunculosis, the results from it had been phenomenal. It would do exactly what the original disease would do. According to Wright, an attack of smallpox reduced one's immunity to pus organisms, and if this were the case (as it undoubtedly was), we ought to be careful about all the vaccines. As to the length of the immunity conferred in any instance, this would depend upon the disease. If a disease itself produced a lasting immunity, we could rest assured that the vaccine of the disease would do the same. The Jenner vaccination, if properly done, undoubtedly protected the individual against smallpox for life; so that there was no need of ever repeating the procedure. If, however, the attack of a disease conferred only a temporary immunity, the same would be true of the vaccine of that disease. It might perhaps last only long enough to cure the case; and the typhoid bacillus might be cited as an instance of this. As regards the immunity produced by antityphoid vaccine, he believed it would last at least long enough to enable a soldier to go through a campaign protected against typhoid.

Dr. Pottenger said that in cases like those described by Dr. Satterlee we were dealing with neurotics, and removing mechanical obstruction was not sufficient. The nervous system of the patient had to be re-educated. This was difficult and took time, and patience was necessary in order to produce results.

Dr. Satterlee, in closing, said he was free to confess that he did not understand the action of colon vaccines. At present we did not have enough data to arrive at a positive opinion concerning them. He believed Lane was right in attributing ulcer and cancer largely to intestinal stasis, and that if we could eliminate intestinal conditions such as some of those he had described in the paper, we would have a much smaller number of these affections to deal with. He had seen many cases in which the general condition of the patient was much improved by the curing of intestinal stasis. As to the toxaemias, he had seen two cases in which the patients had acquired the morphine habit in consequence of having to take so much of the drug for the relief of pain, in which such marked improvement in the condition was caused by the use of colon vaccine that the morphine was altogether dispensed with. As to neurotics, the neurotic condition was in many instances, he believed, due to chronic intestinal trouble. At the same time the psychological aspect of these cases he thought very important.

POSTDIPHTHERITIC PARALYSIS.

Apparently Cured by 60,000 Units of Antitoxin.

BY WILFRED M. BARTON, M. D.,

WASHINGTON, D. C.

Associate Professor of Medicine, Medical Department of Georgetown University; Member of University Hospital Staff; Attending Physician, Washington Asylum Hospital.

The sparsity of reports upon this subject in American literature and the interesting speculations which arise in reference to the rationale of the treatment, have induced me to offer the following contribution on diphtheritic palsy.

CASE. L. E. M., white man, aged twenty-three years, single, weighing 165 pounds, by occupation a supervisor. The family history was negative. His previous history was without interest, as he had never been seriously sick before in his life. He had never acquired syphilis or gonorrhea. He used tobacco and alcohol moderately. August 17, 1913, he was taken with sore throat and quinsy, which turned out later, on bacteriological examination, to be diphtheritic. He received, according to his account, two injections of antitoxin, each of 5,000 units, one on the eighth, the other on the ninth day of his illness. He was confined to bed for three weeks. After getting up, he acquired trouble in swallowing, fluids being regurgitated through the nose. He also noticed that his sight was affected; he could not read the newspapers. Both of these difficulties disappeared in about a week. September 10, 1913, about ten days after getting up, he walked a distance of about thirty blocks, approximately three miles, without great fatigue.

Early in October, 1913, he noticed a feeling of numbness in his legs and forearms, accompanied by weakness in these parts. Three or four days after the onset of these symptoms, he could not walk or use his hands. This state of affairs, however, improved, and after the lapse of two weeks his strength returned enough to enable him to walk, though his limbs felt weak. Thinking to regain his strength, he went to Virginia where he remained a month. During this period there was a gradual improvement up to November 10, 1913, the day before he started home, when he suddenly relapsed. The weakness and numbness rapidly increased, so that, on November 11th, he had to be assisted to the train. On arriving at Washington, he was able to walk out of the station using a cane, but on arriving home he became almost immediately helpless. His hands and feet were absolutely numb; "no feeling at all," as he expressed it, and the muscular power in his hands was so much reduced that he could hold nothing in his fingers and had to be fed. His legs were so feeble that for a time he could neither walk a step nor even stand unsupported. November 19, 1913, I saw the patient for the first time.

Physical examination: Well nourished young man. He walked very slowly and with the greatest difficulty, using a cane which he could hold only feebly in his hand,

and assisted on the other side by an attendant who placed the patient's arm over his shoulder and supported him around the body. When the patient tried to walk, the feet were shuffled forward by motion of the hips, the toes dragging, while the knees bent backward with the weight of the body, making the popliteal spaces prominent. There was no marked atrophy of the leg or arm muscles, though they were very soft and flabby and could not be hardened by contraction. The hand grasps were very weak; the dynamometer gave a pressure of 7 kilograms in the right and 6 in the left All movements of the hands were very weak and he could not hold anything in his fingers. The muscles of respiration, spinal region, neck and face appeared to be normal.

On testing sensibility, there was found diminished sensation, but not total anesthesia of both feet and legs and knees up to a point about one-third distance up the thigh, stopping more or less circularly. The same condition was found in the hands and arms up to a point just above the elbow. The temperature sense and pain sense were diminished over the same region. The patellar tendon reflexes were absent; plantar reflexes also absent or exceedingly feeble: no Babinski; cremasteric reflex present; bulbar reflex absent; testicles felt drawn up, he said. The pupils were normal in size and there was no ophthalmoplegia. Visual acuity normal; pupils reacted to light and accommodation; facial muscles and sensation normal. Throat normal and swallowing not difficult; hearing and taste unaffected; heart normal, but pulse 120 after the exertion of attempting to walk.

On November 22, 1913, the patient was sent to Georgetown Hospital. The temperature on admission was 97.8° F. He was given an injection of 5,000 units of diphtheria antitoxin. A culture was taken on agar from the fauces and posterior nares. November 23d, a second injection of 5,000 units was given, and the examination of the culture was negative. November 24th, a third injection of 5,000 units was given. The patient felt a slight improvement in sensibility in his paretic extremities. November 25th, he could feel the knees together; sensibility to touch seemed to be undoubtedly improved. November 26th, a fourth injection of 5,000 units of antitoxin was given. There was a very slight improvement in muscular power. The grip was slightly stronger. The extension (anterior tibial) of the feet was still very weak. November 27th, a fifth injection was given. Tested as to ability to stand and walk, the patient could stand up, but insecurely so, and could take only a few feeble steps. November 28th, a sixth injection was given. November 29th, tests of sensibility with a cotton swab demonstrated some increase in ability to feel light touches. December 1, 1913, a seventh injection was administered, and December 2d, an eighth injection. Testing the power of the thigh adductors showed considerable strength. These muscles had never been much affected. The abductors of the thigh were weaker than the adductors. Improvement in sensibility was maintained, and the patellar tendon reflexes were very slightly present.

December 3d, there was a ninth injection, 5,000 units, and the patient sat up in his chair for fifteen minutes. December 5th, a tenth injection. December 6th, the patient sat up about two hours. On December 7th, the strength of the muscles of the arms was tested; marked improvement

was apparent. On December 11th, the eleventh injection was given, and on December 12th, the twelfth. On the 15th, the patient's temperature rose to 100.8° F. and he had a mild influenza. On December 17th, however, the temperature was normal again. On the 18th, he walked unassisted from his bed to the door of room, turning slowly and returning to bed without assistance. On the 19th, he walked unassisted a short distance in the corridor. By December 21st and 22d the patient was walking about unassisted and without fatigue. On the 23d, the patellar tendon reflexes were plainly present. The patient could walk quite well, especially when using a cane. There was still a slight overextension of the knees when the body weight was thrown upon them in stepping. The dynamometer showed eighteen kilos in right hand, fourteen kilos in left.

December 27th, the thirty-fifth day, the patient left the hospital. Two days after leaving, he went to work, using a buggy, getting in and out unassisted. On January 4, 1914, the dynamometer showed seventeen kilos in the right, sixteen kilos in the left hand. He said he had been able to write some for the past week. Patellar tendon reflexes were present but faint. He found a little difficulty in going down stairs, but could go up stairs quite normally. His calves felt stiff. Walking was now quite normal and there was only a very slight overextension of the knees. His general health was fine, his weight 150 pounds (normal weight 165 to 170). Since this notation, I have heard from the patient on divers occasions, and he has suffered no relapse.

Recent experimental and pathological investigations have apparently demonstrated that the diphtheritic process affects the lower neuron throughout its entire extent, including the radicular cell and the peripheral nerve fibre. It is somewhat difficult at the present time to say exactly what portion of the phenomena observed are to be referred to the centrally, and what to the peripherally localized lesions. The alterations in the peripheral portion of the neuron are usually regarded as the most important.

It is also generally considered that the pathological changes in the nerves are produced by the toxins elaborated by the diphtheria bacillus; in other words, that the paralysis may be regarded as a paradiphtheritic phenomenon. But in view of the fact that in syphilis the so called paraluetic sequelæ such as locomotor ataxia and general paralysis have been absolutely proved to be true to the perpetuation of a true syphilitic process, it does not appear chimerical or irrational to assume that perhaps also in diphtheria the subsequent paralyses which are observed are due to a genuine diphtheritic process of the peripheral nervous system, though it is unnecessary to add that such a hypothesis is purely speculative and has never been proved, nor, so far as I know, been even suggested, much less subjected to an experimental investigation.

The treatment of diphtheritic paralysis with antitoxin originated in France, in 1898, and since that time, French authors particularly have warmly recommended the method. Combe, in particular, is an ardent advocate of the treatment. He believes that every case of diphtheritic paralysis, recent or old, localized or general, should be treated with antitoxin.

In my own case, there was some fear expressed that the injection in November of antitoxin, three months after the original injection of 10,000 units in August, might give rise to symptoms of anaphylaxis. But no such phenomena were observed. It might be argued that the benefits were due to rest and not to the antitoxin, but inasmuch as the case had suffered two distinct relapses, and was at the time of the injections completely incapacitated by the paralysis, and that the improvement followed so quickly after the injections, with complete recovery in a month, it appears quite fair to assume that the benefits were in reality due to the injections of antitoxin.

The matter of cost of antitoxin to the patient is not an entirely negligible matter, since in my case 00,000 units were used, amounting in all to ninety dollars.

1750 Connecticut Avenue.

CONTINUOUS UTERINE DRAINAGE.

A Résumé of 252 Cases of Intermenstrual Plus Intramenstrual Obstructions—Retention, with Especial Reference to the Former in Causing Uteropelvic Disorders and Infections.

BY A. ERNEST GALLANT, M. D.,

NEW YORK, N. Y.,

Consulting Surgeon, Jamaica Hospital and Eastern Long Island Hospital, Greenport, N. Y.

In a paper read before this society, at the annual meeting in 1909, I presented a résumé of the Therapeutic Drainage in 185 Cases of Uterine Obstruction and in part said: "For the obstructed uterus there is no rest, during the three weeks, more or less, of the intermenstrual period. After menstruation ceases, the uterus remains congested, an excess of mucus is secreted, accumulates in the uterus, and must be expelled by frequently repeated contractions, bringing about muscular hypertrophy, thickening of the walls, and a dilated cavity. The heavy organ dragging on its ligamentous attachments excites numerous aches and pains.

"It is our firm conviction, based upon careful study of several thousand women, that intermenstrual uterine obstruction is far more productive of chronic pelvic disease than the more readily recognized discomfort, distress, or actual suffering during menstruation. . . ." (*Medical Record,* April 16, 1916.)

Since that report, to January 1, 1914, we have had occasion to drain sixty-seven additional cases, making a total of 252 cases treated by this plan.

The modus operandi of intermenstrual retention is a simple, mechanical one. As menstruation subsides or involution progresses, the uterus and cervix contract more or less tightly, closing the internal os; the uterus fills with mucus or serum, the best nutrient media for any pathological bacteria which may be present in the uterus to feed upon, and they multiply in almost incalculable numbers. The internal os being tightly closed or the cervix anteflexed, this infectious material finds outlet in the direction of least resistance, and entering the Fallopian tubes, sets up an actve salpingitis, and not infrequently peritonitis.

This mode of infection we actually witnessed when operating on Mrs. R-64, who presented all the cardinal symptoms of appendicitis, with a mass in the right iliac fossa, and a yellow vaginal secretion, but nothing palpable in the pelvis. Doubting the appendicular origin of the peritonitis, the abdomen was entered through a median incision, disclosing a mass of adherent omentum in the right fossa, the unruptured appendix swimming in pus, which was seen to pour out of the ends of

the tubes, collect in the cul-de-sac, and follow the broad ligament up to the caput coli, and there set up a true peritiphylitis.

A few days after operation, the patient, fearfully and tearfully, admitted that her husband had recently acquired a urethral discharge.

SUMMARY OF 252 CASES INTERMENSTRUAL PLUS INTRAMENSTRUAL OBSTRUCTION—RETENTION.

Groups.	Nulliparæ.	Multiparæ.	Sterile.	Infections.	Totals.
Ages	18-45	20-55	20-36	19-43	18-55
Conditions:					
Single	51	0	0	9	60
Married	13	50	80	49	192
Para—					
Children	0	49	9	30	88
Miscarriages	2?	3	2	3	10
Chief symptoms:					
Menorrhagia	9	7	3	4	23
Metrorrhagia	6	7	1	22	36
Dysmenorrhea	55	19	41	5	120
Pains—					
Headache	11	10	10	0	31
Backache	20	13	18	0	51
Hips, thighs	5	9	8	0	22
Abdominopelvic	10	11	15	0	36
Sterility	0	1	80	2	83
Abortion	0	0	0	47	47
Post partum	0	0	0	6	6
Subinvolution	0	0	0	1	1
Placenta prævia	0	0	0	2	2
Tubal gestation	1	5	1	0	7
Gangrene, vagina	0	0	0	1	1
Septic	0	0	0	23	23
Syphilitic	2	4	1	3	10
Peritonitis	1	0	0	0	1
Pyosalpinx	6	5	3	0	14
Vaginal discharge	7	3	4	2	16
Uterine abnormalities:					
Small os externum	0	0	11	0	11
Anteflexed cervix	28	6	23	4	61
Anteflexion and version	2	1	8	1	12
Anteflex, vers. fix	1	2	3	0	6
Version and fixation	9	10	13	0	32
Version	10	11	11	7	39
Retroflexed uterus	3	1	1	1	6
Thick uterosacral ligaments	11	9	17	0	37
Sequelæ:					
Pregnancy	2	5	24	2	33
Recurrent dysmenorrhea	3	?	2	0	5
Vaginal hysterectomy	1	2	0	1	4
Menorrhagia	1	0	0	4	5

Indications for drainage.—Thinking backward, as we examine the table giving a summary of our 252 cases, we cannot fail to be impressed with the fact that whereas we are apt to associate cervical obstruction with periods of uterine activity—menstruation, labor, abortion—and it cannot be denied that symptomatically it is during these times that we are called upon to take notice thereof, yet, on the other hand, we signally fail to accept the fact that the *origin and cause of obstruction* is always a product of the so called quiescent period, the intermenstruation period, viz., anteflexions (seventy-nine cases), the versions (eighty-nine cases), the retroflexions of the body (six cases), small os externum (eleven),

FIG. 1.—Gallant's silver bivalve uterine drains (two and three inch). The number of days of continuous drainage is indicated by the figures above each drain.

etc., which the uterus has to overcome, at all times, by abnormal and incessant expulsive efforts, the *bête noire* of the human female from puberty to the menopause.

From this viewpoint, how can we hold ourselves guiltless if we neglect to insist that every suffering woman seek relief, and, at the same time, gain security from the dangers which lie lurking within her genital tract, and which may flame up at any time to her destruction.

Do we ever stop to think what incalculable agony must have been the fate of the 120 women here shown to have suffered from dysmenorrhea? Take for instance Case 11-1, Miss D-63, who from her sixteenth to twenty-fourth year suffered twelve hours a day, four days each period, thirteen times a year, or not less than 4,892 hours of bedcompelling dysmenorrhea, which was entirely relieved and cured by dilatation and

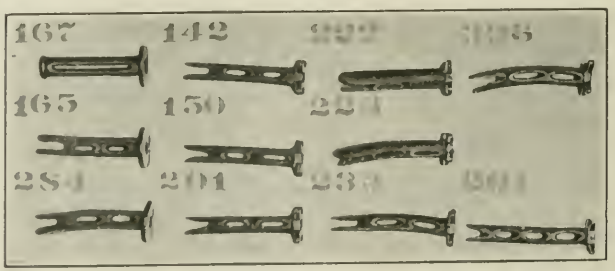

FIG. 2.—Gallant's fenestrated rubber uterine drains (two inch).

drainage? To have relieved so many as has been my privilege, is something of which I speak with becoming modesty, but pardonable pride.

Having been associated with Dr. Paul Outerbridge in his private and hospital work for three years; having seen others make use of several forms of drains; having designed and successfully used the bivalve silver drains for eight years, the fenestrated drain for fourteen years, and in

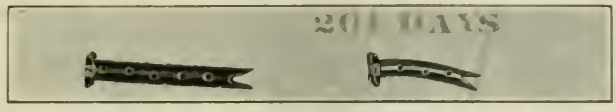

FIG. 3.—Gallant's perforated rubber uterine drains (two and three inch).

view of the fact that five years have elapsed since our last report, during which time many hundreds of the drains have been sold by the makers to many widely distributed practitioners, a number of whom have, by word of mouth at least, confirmed their usefulness and efficiency in draining the uterine cavity, we have taken the liberty to bring to the reader's notice cases demonstrating the fact that these drains can be and should be worn for many months.

To illustrate how first I learned this lesson is recorded in the history of:

CASE XXXIII-1. Miss McC14, suffered so severely each month from menstrual cramps, excessive flow, suproarbital and temporal headache, that she was compelled to go to bed. Two years ago the cervix was dilated and the uterus curetted by Doctor A, but after two months' relief the trouble returned. June 27, 1905, I found the cervix sharply anteflexed, os internum very hard, inelastic, and tightly closed. *Operative technic*: The cervix was dilated to the full extent of a Wylie divulsor; the internal os incised with a blunt histoury to a depth of one eighth to three sixteenths inch—right, left, and front and back—and the dilatation carried up to 35 F. male sound. The curette brought away a considerable quantity of so called "fungosities." A two inch, silver, bivalve drain was inserted in the cervix, and the vagina packed with gauze.

While the drain was in place, her menstrual periods were free from pain, headache, and of normal quantity and duration; but on March 24, 1906, she begged for its reinsertion, which was done under nitrous oxide anesthesia. However, at the next period, the drain was again forced out and she suffered as usual. April 16th, ten per cent. cocaine was applied to the cervix and the drain pushed into the canal. In a few days she returned with the drain in hand. By this time I was thoroughly convinced of two things; 1, that her suffering could be overcome by keeping the drain in the cervix; and, 2, that the drain must be kept in the cervix for a long enough period to neutralize the uterine irritability and keep the cervix from again flexing. April 25, 1906, for the first time I sutured the drain in the cervix, securing it by a silkworm gut suture passed through the right and left cervical wall and the drain fenestra, leaving the ends long, for future ease in their removal. This, however, was unnecessary, as on September 14, 1906, five months after (one hundred and eighty-two days in all) (Fig. 1) suturing in the drain, she wrote me saying that having felt "some

thing at front" she had removed the drain and returned it to me. During the past eight years, she has experienced about one hour of cramps at the onset of the menses, but being free from headache and menorrhagia, she is content to let well enough alone.

The details of this case are here given, as it shows the technic of the introduction of the drain and also taught me that:

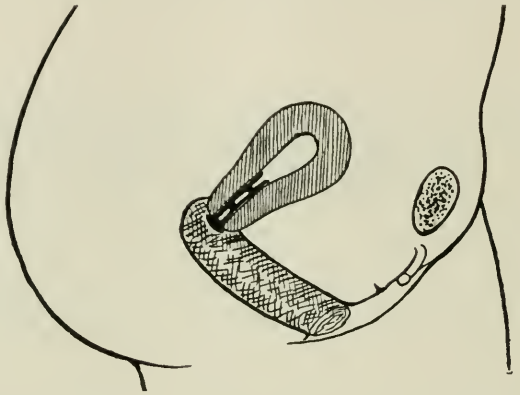

FIG. 4—Showing bivalve drain in the cervix and roll gauze wick in vagina.

1. While the drain is *in situ,* symptomatic relief can be secured.

2. To overcome the expulsive action of the uterus, the drain must be sutured into the cervix by some insoluble material.

3. To prevent the recontraction of the internal os, the reflextion of the cervix, and secure permanent patency of the cervical canal, the drain must remain continuously therein for six or more months.

4. That on account of oxidation of the silver drain, the fenestrated, or perforated rubber drain must be employed.

Ever since the return of that badly oxidized silver drain, it has been my practice in all cases operated in for intermenstrual obstruction, whether caused by anteflexion of the cervix (seventy-nine cases), fibrous internal os, or other obstructing factors, indicated by dysmenorrhea, headache, menorrhagia, metrorrhagia, sterility, etc., to suture the drain in the cervix, from which it was not removed until a permanent cure was looked for. On the other hand, in the presence of an acute infection, after abortion or miscarriage, or post partum sapremia, for the relief of post partum pains, and whenever the uterine cavity measured four inches or more, the three or four inch silver bivalve drain was inserted and there remained until expelled from the cervix by the rapidly involuting uterus, when, if necessary it was replaced by the two inch drain, sutured into the cervix.

That the "fenestrated" rubber drain (Fig. 2) may be securely and safely left in place for long periods is shown by the following cases:

CASE LXIV-1. *Menstrual headache, colitis, prolapsed right kidney and stomach.* Miss O'C.-202, suffered severe headache over right temple, at each menstruation; and for some weeks with colicky, diarrheal movements after each meal, and excessive nervousness, running up along the descending colon. Considerable mucus passed in each stool. Her whole colon was very sensitive; right kidney prolapsed six inches below the chondral border; greater curvature of the stomach on a level with the symphysis pubis. May 28, 1913, the anteflexed cervix was dilated, uterine cavity irrigated, a 30 F. fenestrated drain sutured into the cervix, and appropriate treatment and diet for the colitis instituted. January 20, 1914, the drain, after being *in situ* seven months and twenty-one days (233 days) was removed. The menstrual headaches had ceased, there was no "slime" in the stools, the bowels moved once daily; and she had increased in weight twenty-four pounds. A special corset had been worn for the past six months.

CASE LVIII-1. *Menstrual diarrhea, and collapse.* Miss L.-69, aged twenty-four years, since her menses began at fifteen, had always had diarrhea the day before, followed by vomiting of bile, weak spells, and unconsciousness, lasting from a few hours to, of late, the whole day. There were no cramps, but during the fainting spells she perspired profusely, turned cold, her legs jerked, and she felt as if at death's door. September 23, 1911, after dilatation and curettement a two inch fenestrated drain was sutured in the cervix and the retroverted uterus restored to proper position by an Albert Smith pessary. The drain was worn until July 7, 1912, nine months and fourteen days (284 days), and the pessary until just prior to her marriage, on Christmas day, 1912. May 22, 1913, she wrote of her good health and freedom from attacks for over a year past. Recently this patient miscarried.

CASE LXI-1. *Menstrual, pendulous kidney crises.* Miss L.-202 for several years, had suffered with an aching pain, just below the waist line, to the right of the navel, and associated bilious headaches; only relieved by going to bed, and followed by frequent urination after getting on her feet. Examination showed anteflexed cervix; right kidney prolapsed, pendulous, lying at the umbilicus, replaceable; prolapsed stomach on the symphysis pubis. Appendix palpable, tender. June 26, 1912, cervix dilated, with difficulty, fenestrated drain sutured in cervix. Appendix removed through right oblique incision, after uncoiling it from behind the caput coli. July 30th she was fitted with a corset. September 27, 1913, the drain having been *in situ* fifteen months and a day (396 days), was removed and she was furnished with a new corset. From the time of her recovery after the operation, she was able to work daily without interruption, and gained nine pounds.

CASE LIV-1. *Dysmenorrhea; Chronic acne vulgaris treated by autogenous culture.* Miss D.-70, aged twenty-two years. Stepmother said, "she was born with the heat;" nymphomania since baby. Did not manipulate, but went into a sort of spasm which ended in orgasm. Mentally and morally defective, stole anything. Her mother was said to have watched animals in *flagrante delicto*. Always had nocturnal incontinence. For past seven or eight years had a persistent, incurable acne. On applying to Dr. E. D. Lovejoy for treatment of her face, he, believing the menstrual disorder should be corrected at the same time as the skin, on December 8, 1910, after curettement, a No. 2 silver bivalve drain was sutured in the cervix. The thickened uterosacral ligaments were forcibly stretched and partial mobility restored. Gauze roll drain in vagina (Fig. 4). She stated that her flow was some months prolonged, at others lasting but three days; but her stories were not always to be depended upon. The drain was removed after being in the cervix four months and nine days. Her facial acne slowly improved, under the hypodermic injections of autogenous cultures as reported by Doctor Lovejoy, Isolation and Growth of the Acne Bacillus (*Journal Cutaneous Disease*, February, 1911).

Case LXXIX-3. *Sterility, nightmare, dysmenorrhea, retroversion.* Mrs. G.-207, married four months, had been flowing six to seven days (formerly three to four days), terrible nightmare the night before flow began. Fundus uteri and right broad ligament and ovary prolapsed posteriorly; the cervix one inch from the hymen. July 28, 1913, uterosacral ligaments were very tough, Y shaped; thoroughly stretched, and uterus lifted. Cervix dilated, very tough internal os incised on four sides. Fenestrated rubber drain sutured in cervix, gauze roll in vagina. Next day, a two inch round pessary inserted. During the following five months, menstruation more normal, lasting from three to five days. January 20, 1914, after five months and fifteen days (165 days), the drain was removed. April 16th, having had no more of the "nightmares," she wished the pessary removed. The character of the vaginal discharge, and the pelvic condition led me to suspect gonorrhea.

Case LXXX-3. *Primary sterility due to antecurved cervix; perforated drain* (Fig. 3). May 3, 1913, Mrs. McG.-210, aged twenty-nine years, married two years. Menses regular, painless. Fundus forward, cervix curved forward, one inch from the hymen. Left broad ligament thickened and shortened, under anesthesia was thoroughly stretched. Cervix dilated; uterus three and one-half inches deep, hollow, curetted, and irrigated. New model perforated drain sutured in cervix. Gauze roll in vagina. Menses: May, normal; June, ten days; July, eight days; August, four days. September 19th, drain removed (201 days *in situ*) in the hope that she would become pregnant at once. When seen April 2, 1914, menstruation had been somewhat irregular; at times a sharp pain on left side of pelvis; and a burning sensation in the appendix region. Fearing ectopic gestation, she was cautioned to return if the sharp pain continued. May 23d, menses regular, colicky pain had ceased and this she attributed to the daily eating of two tablespoonfuls of prepared bran. Her weight had increased fifteen pounds. She was advised to cohabit in the knee-breast posture, as offering the most favorable chance for insemination.

Case XLVII-2. *Drainage at seventy-seven years for hemorrhage due to intramural fibroid.* Mrs. L.-203, aged seventy-seven years, during the past six months had lost considerable blood from the vagina. October 26, 1912, under gas-ether, a tumor was found, extending to the umbilicus. In the vagina a large cervical cyst attached at the external os, was cut away; the sound was passed five inches into the uterus, and an intramural fibroid disclosed. The cervix was bent forward at an acute angle, the bleeding evidently coming from the uterine cavity. As her son, a physician, feared hysterectomy, we compromised by suturing into the cervix a three inch silver bivalve drain. For over a year, when last heard from, there had been no flowing, and the drain was still *in situ*. The curve of the drain corresponded to the curve of the fibroid and overcame its ball valve action, permitting free drainage, and the bleeding stopped.

Case LIII-4. *Flooding due to necrotic cervical polypus; menorrhagia.* April 3, 1912, Mrs. K.-201, patient of Dr. B. D. Skinner, had been flooding at menses for one and one half year, with "show" all the time. Necrotic polypus protruding from os externum, easily removed, from just inside os. Cervix dilated, uterus curetted; two inch rubber drain sutured in cervix. The drain was left *in situ* until September, five months (150 days) and removed on account of "too much flow." After the drain was removed, the excessive flow ceased.

EXCESSIVE FLOW WHILE THE DRAIN IS IN THE CERVIX.

A somewhat inexplicable condition in some cases, has been menorrhagia and metrorrhagia while the drain is in the cervix, controllable in some by ergot and quinine, in others by potassium iodide or mixed treat-

ment; in a few cases only by removing the drain, when the menses return to the normal. At present I am using a drain of smaller calibre than those used heretofore (28-30 F.), and shall diminish the size to 20 F., hoping to work out some rational explanation to report later. As shown by the following list, we have kept the drain in for some months in spite of the flow:

Case LX-1. Cervical polypus, excessive menstruation; ergot; drain in 133 days.

Case LXIII-1. Dysmenorrhea, menstruation two weeks each month; drain in 201 days.

Case LXXVIII-3. Sterility, lecucorrhea, cannot stand up during menstruation; drain in 151 days.

Case LXXX-3. Sterility, excessive flow two months; drain in 142 days.

Case LIII-4. Cervical polypus, excessive flow till drain out; drain in 150 days.

Case LIV-1. Dysmenorrhea, prolonged menstruation; drain in 131 days.

SUMMARY.

1. Normally the menstrual blood condenses in the passive uterus, escapes drop by drop, or trickles from the os externum in a bright red, intermittent stream, without malaise, pain, headache, or any sort of reflex manifestation.

2. Obstruction to the free outflow may be caused by fibrosis, cicatrization, flexure, neoplasm of any portion of the cervical canal or involving the lower uterine zone.

3. Obstruction is primarily an intermenstrual condition, which (a) causes retention of mucus, etc., within the uterus; (b) retards the outflow of menstrual blood; and (c) shuts in the dangerous remnants after abortion, miscarriage, and labor, and the gonococcus.

4. Obstruction excites the uterus to laborlike activity, brings about hypertrophy of its wall, enlargement of its cavity, increased weight, and an abnormal condition of its mucous membrane.

5. Obstruction during menstruation causes colicky cramps, laborlike pains, backache, headache, and other reflex pains; (b) obstruction during labor causes serious dystocia; (c) obstruction after labor induces after pains, facilitates infection, and favors subinvolution; (d) obstruction between periods, intermenstrual, forces infection into the tubes and peritoneum, and results in peritonitis, tubal gestation, hydrosalpingitis and pyosalpingitis, and, by thus obstructing the tubes, is the most common cause of sterility, and frequently is at the bottom of marital infelicity, leading to the divorce courts and the hospital, and if the woman escapes with her life, she will be compelled to live an aphoric life, subsisting on the alimony which the courts offer as her only means of redress.

6. Obstruction in young or older women can be and should be remedied, by dilatation, drainage, replacement, pessary support, or suspension of the uterus.

7. Continuous efficient drainage can be secured only by the use of a drain which will permit the cervical mucus to pour into the drain, mingle with the secretions, and prevent clotting and plugging.

8. To prevent recontracture of the internal os, reflexure of the anteflexion, the drain must be of rubber, fenestrated or perforated, sutured in the cervix and must remain *in situ* for six or more months.

9. Experience teaches that, except for the removal of detached secundines or placenta, curettage is unwise and can therefore be dispensed with.

10. To secure uninterrupted drainage from the uterine cavity in acute cases a gauze roll wick should be placed in the vagina, with its upper end under the drain and the lower end projecting through the vulva so as to come in actual contact with the vulva pad, otherwise pus will collect in the vagina and sapremia will result.

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DISCUSSION.

Dr. MORRIS asked Dr. Gallant what he would do for cases with actual endometritis, Another point. We should always remember that uterine versions and flexions were seldom primary affections, but the result of other conditions; being like a sneeze in this respect.

Dr. GALLANT said that the projection of the mucous membrane into the drain canal was not an injury; but he got the idea that more numerous openings (perforations in the drain) would give a better opportunity for the mucous glands to pour into the canal. In a few cases there was continuous metrorrhagia, but this had ceased after the removal of the drain. As to endometritis, he believed, with Kelly, that there was no such thing. What we really had to deal with was an adenoid condition. He had found that the cases which he curetted did not do any better than those not curetted.

AN IMPROVED ETHER INHALER.

BY A. ERNEST GALLANT, M.D.,

NEW YORK, N. Y.

In a letter to the editor of the *New York State Medical Journal* (December, 1911, p. 560), James Taylor Lewis, counsel, writes: "The question of having trained nurses give anesthesia in hospitals is a matter of very serious moment. . . . Of course, I assume that a nurse during her training is given special instruction in the administration of various kinds of general anesthetics. Yet she cannot be sufficiently informed to do so, and I believe that the law does not authorize her to take part in so important, indeed so vital a procedure incident to surgical work. I believe that nurses doing so are within the pale of the law, and I believe that the practice should stop if it exists."

Naturally, the questions arise: 1. Why teach the nurse a thing which by law she is prohibited from doing? 2. What can we do, inside and outside the hospital, especially among the poor who find it a burden to pay even

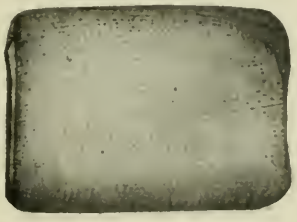

FIG. 1.—Stocking covering metal drum pinned or sewed on, ready to be inserted in the rubber sleeve.

small fees, in obstetric and minor surgical operations done at home, if the law insists that we may not make use of our nurses for this purpose? 3. Does this law also make it a crime to call on the husband, the mid-wife, or a neighbor, when no one else is at hand, or the patient is unable to pay for the service of an additional doctor? 4. Is it a crime for the doctor to "put the patient under" the anesthetic and hand the chloroform or ether to the nurse or to whoever may be at hand, while the operator proceeds to deliver the baby, curette the uterus, or incise the abscess, as the case may be?

If under the law of New York we may employ only a medical confrère to administer anesthetics, in self defense and for the best interests of our patients it is up to us to insist that every student in every medical school be taught some simple and safe method, as well as the more complicated, costly, compound modes of anesthesia.

In their praiseworthy efforts to evolve safe methods of anesthesia, the specialists have added one drug after the other, necessitating more and more complicated, cumbersome, and expensive apparatus, which can be handled only by those trained to the work, and which requires an express wagon to transport the machine, which weighs over a hundred pounds, and involves an outlay of a hundred or more dollars, and a fee from three to one hundred times the amount formerly charged by the anesthetist; a fee which under the circumstances he is justly entitled to receive.

Complex machines and compound methods will perhaps always appeal to the specialist in this as in many other lines, but after twenty-five years' experience in giving anesthetics and employing others for that purpose, my own preference is for an inhaler, 1, simple in construction; 2, simple to learn to use; 3, sparing of ether, and, 4, safe in the hands of the most inexperienced, layman, midwife, nurse, or doctor; 5, sanitary, in that it can be easily taken apart, sterilized, and reassembled.

The inhaler herewith presented represents the evolution of the Allis inhaler to the more simple, safe, saving, sanitary model of 1912, which was presented November 28, 1912, to the Medical Association of the Greater City of New York. (*Year Book*, June, 1913, p. 46.)

In 1892, the sleeve was lengthened from six to nine inches to allow the upper part to be folded over and keep the ether from escaping so freely, and to heat the ether before it entered the lungs. In 1894, we did away with the interlaced bandage, substituted a gauze diaphragm at the lower end, and inserted a small piece of gauze loosely in the centre to receive the ether. (*International Journal of Surgery*, XII, 223, 1899; *Medical Record*, December 30, 1899.) But this plan did not afford the needed evaporating surface so essential for rapid entrance and absorption of ether in the lungs.

The inhaler now consists of two parts: 1. An oblong, *metal drum* (Fig. 1), two inches wide, four inches long, and three and a half inches deep. Its sides are without fenestræ. The drumheads are formed by slipping the drum sidewise into a six inch piece of an old stocking, or small stockinet such as is used for the kneecap; or by winding over the ends of the drum with a gauze bandage so as to cover them with eight thicknesses of gauze, securing them in place by rubber bands, pinning, or strips of rubber adhesive plaster. When thus properly covered, the drum is inserted into its *rubber sleeve* (Fig. 2), five and a half by nine inches, on the top of which has been added a flap or tongue; and inside the sleeve it forms a chamber, near the bottom a corded ridge, wherein the ether can be rapidly evaporated and heated before being inhaled and thereby guards against postanesthetic bronchitis or worse. The flap can be thrown from side to side, opening the top, for dropping in more ether or securing greater heating and concentration of the amount inhaled. This also leaves the right hand free for other uses. The plate on the flap is to weigh it down.

The drum can be made from a three and a half inch length of four inch

leader pipe, bent into an oblong, covered with stockinet or wound with gauze, wrapped around with newspaper to form the sleeve, and stitched or pinned together. We have used thick cardboard and a towel. From the foregoing, after so many years' experience, we deem it justifiable to hold that the Gallant inhaler is simple in construction; any novice can make one and use it; with ether, chloroform, or in combination, but for chloroform

FIG. 2.—Rubber sleeve with flap for closing the top; A, projecting cord inside to hold the drum well above the nose.

the *top must always be kept open.* It is safe, whether the ether is poured in, or by the drop method, the double drumheads will prevent its running down into the throat, afford a large area for rapid evaporation, and the sleeve acts as a heating chamber, preventing bronchitis or worse. The inhaler is also saving. The cost is very small; it requires no express wagon to transport it; the quantity of ether during the first hour averages 100 c. c. less, when preceded by hypodermic of hyoscine, morphine, or the oil of bitter orange peel (Gwathmey, NEW YORK MEDICAL JOURNAL, September 14, 1912; November 29, 1913), and the patient goes under with much less excitement.

Nitrous oxide or oxygen may be introduced at the top or bottom, for primary anesthesia or stimulating purposes. The inhaler, finally, is sanitary. The drum is easily removed from the sleeve, the drumheads are readily changed, and, after cleaning and drying, it can be sterilized, quickly replaced, and dropped into the operating bag, ready for immediate use.

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